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GAS JOURNAL

LIGHT • HEAT • POWER • BYE-PRODUCTS

[Founded in 1849 as the "Journal of Gas Lighting."]

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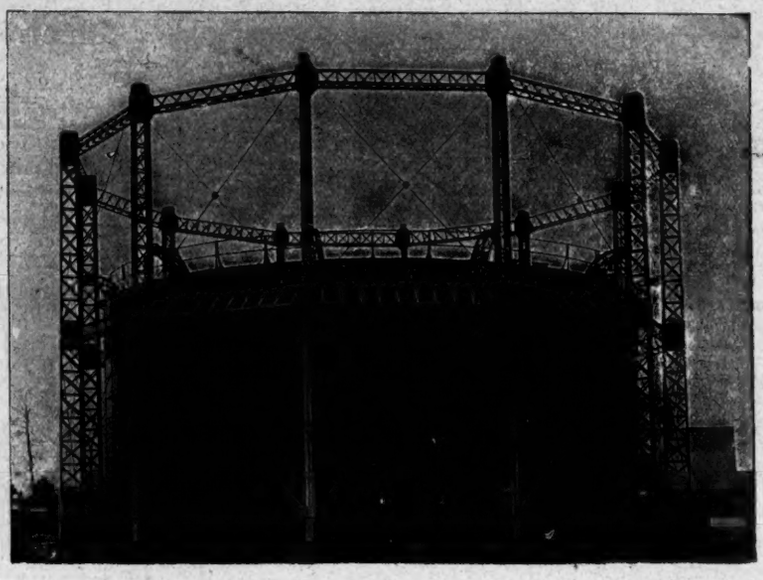

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EDITORIAL NOTES.

A Medical Journal's Criticism of the CO Report.

A SINGULARLY impotent and inconclusive editorial article has appeared in the "British Medical Journal" on the subject of the Carbon Monoxide Committee's report. The article is reprinted in another column, as we feel that this will do good service in showing that if it represents the most searching medical criticism that can be made of the report, then the Committee had the fullest justification for their findings and recommendations. Our contemporary adopts a very narrow standpoint, and exposes its ill-information. It is obvious that judgment has been passed on a very superficial reading of the report itself, and not upon the evidence which the members of the Committee had before them. It is complained by the "British Medical Journal" that the Committee have not published any summary of the evidence submitted to them. Therefore, it is very clear it has not had the same facilities for passing judgment upon the report as the Committee had for arriving at their verdict and recommendations. Nevertheless, our contemporary considers it its duty to point out the dangers quite clearly, as the Committee "evidently failed to realize them." There is assumption and postulation all through the article. This initial assumption as to the Committee having failed to appreciate the dangers quite clearly, indicates the very shallow reading there has been of the report itself, and the total absence of knowledge as to the testimony placed before the Committee. The dangers and risks of carbon monoxide were as fully before the Committee as were all other features of the evidence, including the one as to the value in all heating operations of carbon monoxide as a constituent of gas, which reminds us that the heading of our contemporary's article is "The Dangers of Carbon Mon-"oxide in Lighting Gas," while a very large proportion of town gas is now used for heating and industrial purposes. This brings out a striking omission in the article, and that is the value of the increasing use of gas for domestic heating in promoting a more salubrious condition of the atmosphere, and therefore giving to the people a more healthful environment. Of course, recognition of these points—important as they are from the scientific and medical standpoints—would not have assisted our contemporary in its attack upon one side only of a multi-sided question. It is hoped, however, that the appeal made in the article to members of the medical profession and particularly medical officers of health, to watch carefully the dangers due to increasing percentages of carbon monoxide in "lighting" gas, will find its balance (and something more) in a conviction in the minds of the watchers that the improvement in our atmospherical conditions and home life generally justifies the extension of the use of the gas that can be most economically produced. And it does not follow that under all conditions that gas will be water gas.

The faulty construction of the criticism, and the failure to look at it from its true perspective and from all angles, is seen right from the beginning. "If there were reason to "believe," it is remarked in the opening passages, "that gas "undertakings will continue to follow the present practice "in this country of keeping the percentage of carbon mon-"oxide within moderate bounds, we should hesitate to "criticize the present report. The country is certainly sick "of official restrictions on industry." What "reason" can our contemporary assign for any belief that gas undertakings will not continue to follow the present practice of keeping the percentage of carbon monoxide within moderate bounds? The "moderate bounds" vary considerably in different districts in the country; and some of the cleanest sheets in regard to fatalities come from areas in which the largest percentages of water gas are used. The medical paper does not suggest a single "reason" for its belief, other than that it fears the Committee's report is extremely likely to induce the directors of gas undertakings to make a series of dangerous experiments on the public. Experiments which our contemporary might before the event have labelled "dangerous," have been made during the war and the coal strike; and the "danger" has failed to materialize. Should, however, the developments made in future by gas undertakings have unfavourable results, the Committee have made provision for this, which our medical contemporary ignores either deliberately or negligently. In their conclusions, the Committee said: "We suggest that the De-"partments concerned should carefully watch the situation, "so that, if the freedom from limitation which we recom-"mend is accompanied by any unexpectedly unfavourable "results, the attention of Parliament may, if necessary, "be again directed to the matter." Continued freedom or future limitation are therefore contingent upon circumstances arising from (as yet) unknown gas-making developments. But, so far as can yet be seen, economic conditions will, in the whole, form such a restrictive force that there will be no extraordinary increase in the amount of carbon monoxide beyond what are now in daily working the maximum limits in this country, and upon which maximum limits there has been such encouraging testimony that the theoretical carbon monoxide risk has received no practical demonstration or confirmation.

But our medical contemporary goes back to that old report of the Home Office Committee of twenty-two years ago, when water-gas use was in its infancy here, and the experience there has been with it since under the conditions of supply existing in this country was altogether unknown—experience which includes periods of maximum production from the plants in existence during the past seven years of war and industrial strife. Our medical contemporary entirely fails to apply the rectification supplied by the experience of these years to the theories and assumptions that formed the foundation for the report nearly a quarter of a century since. That report experience has completely wrecked; and the passing of years has consigned it to that mighty accumulation of error which has arisen in mundane affairs from one-sided judgment. If all promising developments were pre-judged as that Committee pre-judged this one, then many of the modern advances that have been made would have been stifled in their incipient stages. Let our medical contemporary compare the electrical fatalities given in Home Office reports with those arising from carbon monoxide under the worst of conditions in respect of producer gas, also the fatalities arising from motor traction compared with the days of horse traction, and the study may probably assist it to look at this question of carbon monoxide risk from the standpoint of 1921 and not 1898. It admits that the cases of poisoning by "lighting" gas in this country are still small in comparison with the number in the United States; but it adds "the "increase [such as it is] in this country has been coincident "with the increase in the partial admixture of water gas "with coal gas." Again the narrow point of view! Has the increase been relative to the increase in the number of gas consumers, the enormous increase in the number of points of gas use, or the increase in the consumption of gas in the United Kingdom? These are questions that our medical contemporary should answer; otherwise its criticism must stand condemned alone on the point of want of

competence to deal with the matter from all points of view. We are sorry that a paper of the scientific standing of the "British Medical Journal" should have exposed itself to criticism on the ground of incomprehensive survey of this particular question.

An Opportunity that is Being Missed.

"THE public are now directly interested in the adoption of "the most economical and efficient means of production "by the gas undertakings." These words were used by Sir George Beilby in the recent interview a representative of "The Times" had with him regarding the subject of smokeless fuel, which interview was noticed by us a fortnight ago. The statement is a striking one. But on the meaning given to the words "directly interested" depends the amount of truth there is in the statement, or the amount of change that has come about in the public attitude. "Interest" is an expression with several meanings. Numerous gas consumers have been "directly interested" in the adoption of the most economical and efficient means of producing gas ever since the sliding-scale came in to assist gas companies, and more recently the South Metropolitan profit-division plan. But we suppose that quite ninety-nine out of every hundred consumers were unaware of the fact that they were directly interested. Now we have the heat-unit method of charging, for the birth of which Sir George Beilby and the Board of Fuel Research were largely responsible. With charges on this basis, the gas consumers are doubly interested in the adoption of the most economical and efficient means of producing gas, though they may not be conscious of it. The truth is that very few gas undertakings can boast of being good educationists so far as the gas consumers are concerned. Nor can they claim to be extraordinarily ready to grasp suitable opportunities for doing a bit of educational work, and persevering with it. The change to the heat-unit basis gives a fine opportunity; but imagination has not been so far a strongly asserted trait in connection with it. In the case of many undertakings, the utmost that has been done on the change being made has been to inform gas consumers that, under the Gas Regulation Act, the charge in future is to be for the number of heat units supplied; that 100,000 B.Th.U. constitute a therm; that the charge per therm will be so much; that the declared value of the gas per cubic foot is so many B.Th.U.; and that the state of the meter, deducting the former reading, multiplied by the declared value, and divided by 100,000, will show how many therms have to be paid for.

That is all; and the consumer wonders why the change. Several notices we have seen have not condescended to tell the consumer explicitly that it means he is now to be charged on quality, or for the actual potential heat energy that he takes, and not the volume of gas in cubic feet. Nor has he been informed of the protection that will be afforded him by the systematic testing on behalf of the local authority and the indications of a recording calorimeter. These are important points; but there are others. The ordinary consumer, of course, does not know anything (or very little) about the technical work associated with the production of gas; and he is not therefore competent to raise his voice in favour of any particular method, which may be an economical and efficient means of producing gas, but may not be the best in all the individual circumstances of a gas undertaking. Nevertheless, Sir George Beilby is right. The public are directly interested in the adoption of the most economical and efficient means of producing gas; and they ought to be shown in what way. They should have the fact explained to them that the efficiency of the use of gas does not depend upon the declared calorific value, or the concentration of heat value, per cubic foot of gas *per se*, but upon the correct utilization of the gas in their own appliances. The public are interested in the adoption of the most economical and efficient means of producing gas so that the charge per therm may be the lowest possible. Let them know this, and their interest in the matter will be changed from that of which they were oblivious to an interest that will be very much alive. Many a consumer would then be frankly and usefully concerned in helping forward anything that would conduce to economical and efficient production. And what is highly important, he would do his part in assuring that the house fittings and apparatus were in a fit condition to give him the highest efficiency from the use of that gas.

For instance, Mr. M'Lusky, in his North British paper, as published this week, speaks of the inadequacy of the piping in many of the older types of dwellings for the several points of considerable gas use that are now to be found in houses, the tenants in which want modern conveniences. Because the pipes in some of the older houses are not of sufficient diameter to act as carriers of gas of a lower thermal concentration for the multiform uses of to-day, residents in other houses, the cause of progress, and the conservation of coal cannot be ignored, and a standstill policy be pursued. As the opportunity permits, the most economical and efficient means of gas production must be adopted. The laws of progress must be obeyed. And the tenants of houses, with a knowledge of their interest in the most economical and efficient means of producing gas, will be better negotiators for a revision of house piping with landlords, or (if they are themselves the house owners) with their own purses, than the representatives of a gas industry, who will be looked upon as interested as heat-unit sellers, and not as users. The latter will have the more cogent arguments to advance as to why the landlords should bring their gas-piping into alignment with the requirements of the times. Moreover, this should be to the interest of the landlord, as the more gas heating becomes established as the modern method, the less will be the wear and tear upon his property, and the greater the attractions of the property. Furthermore, this would be effectively helping to promote the purity of the atmosphere. Atmospheric impurity has a very disastrous effect upon both the external and internal paint and decorations of houses. The more gas heating is employed, the sooner shall we get to that more wholesome condition of the atmosphere about which Sir Napier Shaw was speaking the other week in the columns of "The Times," and which was proved to be a very real thing during the enforced restricted use of coal through the period of the coal strike, which never ought to have been, but which had its material lessons for the community as well as for organized labour.

There are many other points which could be made as to the economy and labour-saving of gas compared with the use of coal for the same purpose—all to show the interest that economical and efficient gas production has for the consumer. These other points are old ones, however, though as true to-day as ever. But gas managements should take the necessary steps to inculcate in the minds of the public that they have a direct interest in the changes that have come, and are coming, about in the gas industry, and in the economical use of gas. The public have no knowledge of these things. They ought to have. Now is the time for the work. The forthcoming meeting of the British Commercial Gas Association should be the occasion to bring to the notice of gas administrators the favourable opportunity that is presented by the change in the method of charging for arousing a greater interest in the minds of the public as to their concern in the most economical and efficient means of producing gas.

Deficient Internal Piping.

IN the policy of developing the gas business, the industry is faced by an important obstacle, to which Mr. John W. M'Lusky, of Glasgow, directed attention in a short paper, at the annual meeting of the North British Gas Managers' Association. He also made a suggestion which, we think, it would be a good thing to adopt. No real harm could come of it; and there are good chances that it would be highly beneficial, because anything that does nothing more than spread information of defects and remedies must have a very salutary effect. "Bad gas," is the consumers' "commonest complaint." That is how it is described by Mr. M'Lusky; and "bad gas" more often than not means deficient pressure and carrying capacity. We know this is so from the efficiency investigations as to gas of different grades in both calorific power and composition. Nevertheless, the whole ignominy of deficiency is placed on the gas, simply because the consumer knows no better, and is not cognizant of the fact that his or his landlord's own property may be the real offender. The consumer wants more gas-fires, perhaps a circulator or boiler, in addition to his gas lighting and cooking. He knows nothing about his house pipes being overloaded. He is aware that a pint jug will not hold a quart; but it is a positive mystery to him why his gas-piping will not transmit to every point of use as much gas as he needs at one time—gas-piping that was originally put in to serve only lighting and perhaps a cooker. The cheapest method of increasing gas business is,

of course, to connect-up additional appliances to existing house systems; but it is no use doing this if it means domestic inefficiency and perpetual complaint.

Gas undertakings may, as is being done in Glasgow, improve their distribution organization by boosting systems to meet any regional shortage. This betters matters; the gas is there for the consumers' use. But it is only part of the improvement scheme. The other part is inside the houses themselves; and there the owner or tenant is in the case of "ordinary" consumers the individual responsible, though the gas undertaking is an interested party. This being so, Mr. M'Lusky is of opinion that a campaign on deficient internal piping can be best promoted by co-operative effort. He therefore asked the members of the Association in their corporate capacity: "What are we going to do, as an "Association, to evolve some definite scheme to increase "existing internal pipes in old properties?" This is not a matter to which a reply can be given without due deliberation. Therefore Mr. M'Lusky suggested that a Committee of the Scottish gas industry—consisting of the Council of the Association, with six other representatives—should carefully consider the matter; and town clerks, gas conveners, and representative chairmen of gas companies might be included later. This Committee he proposed should draw-up a definite policy of procedure, subject to the approval of the Association; and this would, in turn, be submitted to a representative body of property owners or their agents. Unless something of this kind is done, Mr. M'Lusky fears the gas industry will simply mark-time so far as the older properties are concerned, particularly in face of the activity of the electrical competitor. We think he is right. It will also be observed that Mr. M'Lusky is an advocate of systematic, and not patchwork, maintenance of gas appliances. His idea is good service throughout. But as to the main part of his paper, we shall look with interest—at present we are looking in vain—for the development of any concerted action to try to effect a remedy for the carrying deficiencies of ancient internal piping. This is highly important in conjunction with the changes in manufacturing policy, which means a lower thermal concentration per cubic foot, but not a lower efficiency in use, providing the transmitting facilities are sufficient right to the point of combustion. The Association has taken no immediate action in the matter; but perhaps the Council will consider it, without wasting too much precious time. The discussion to which the paper gave rise was an excellent one. It was full of practical experience—one interesting point being that men who have supplied 420 B.Th.U. gas speak highly of their experiences; but men who have not done so, or perhaps have neglected doing what they ought to have done when sending out the lower calorific power gas, are not very sanguine about a gas of such a thermal value. Experience on right lines is an excellent educator.

Market Prices and Improved Dividends.

THE market values for gas stocks and shares are on the upward move. The number of bargains that have been recently made for cash show that there are a lot of either necessitous or foolish people who have been holding the stocks and shares, and have now disposed of them, just at the beginning of the return movement. The number of bargains also show that there is no dearth of people desirous of obtaining possession of the stocks and shares at present prices; and those who can do so, and have the money to spare, are wise. But the upward movements are slow and, comparing different companies and prices, vagarious. This is curious. The whole position is curious; and we rather think it betokens on the part of investors a sense of uncertainty as to the future—an uncertainty that is not shared in so far as gas trading is concerned by those who are intimately connected with it. All through the war the capacity of the industry to earn sufficient money (if allowed to do so) has been in existence; and only restrictive statutory authorization as to charges and dividends has prevented the money being earned to pay pre-war dividends. This those within the industry have known; but the Stock Exchange and investors do not measure values by the inherent capacity for earning, but by the actual dividends paid in relation to the price per cent. Now the first revised dividends are being paid under the Orders issued in pursuance of the powers conferred by the Gas Regulation Act. But if the values are examined of companies' stocks that have paid improved dividends, some singular points are noticed. It is seen, comparing the market values that were ruling when the Orders were issued with those now obtaining, that changes in value have been remarkably small in some cases, while in others quite substantial additions have been made, though the last dividends paid before the Orders were issued were the same. Some stocks have stood practically still. Others have risen 3, 4, 5, up to 8 and even 15 and 17 points. There is one "B" stock, formerly paying the temporarily statutory £2 12s. 6d., that is now paying 5½ p.c., and has gone up about 15 points. We see another company's "A" stock that was paying 3¾ p.c. in latter times, and to-day has returned to 6 p.c., but which has only gone up 5 or 6 points, and now stands at practically the same price as the "B" stock of the company paying 5½ p.c. This is only an example of others. Among the ordinary stocks, prices are found to-day which will pay the investor 7½, 8, and between 9 and 10 p.c. Holders are foolish who part with their stocks at prices such as those ruling to-day.

The Policy that Fails—Always.

THE recent Trades Union Congress at Cardiff has exposed very clearly certain facts and tendencies. The industrial workers of the country should note them, and insist on definite policies, and not allow those of their leaders who are inefficient to pursue divergent ideals that cancel-out each other. Most of the resolutions passed at the Congress were conflicting. The men who were there might be formed into groups with views and aims directly antagonistic one to the other. There is no concentration by them upon work that would be industrially good, and therefore good for the workers. Those who, if left to themselves, would concentrate upon what is good find themselves confronted by the forces of disintegration, and curiously enough in a measure they give way to them, apparently for the sake of peace, instead of turning-down what they know to be inimical to the members of the unions as a whole, and exposing a robust front in favour of that which is constructive. While this kind of thing continues, there can be no genuine and durable progress. There must be failure; there can be nothing else. The workers must arouse themselves, and recognize that extremists are the curse of the trade unions to-day, and nothing that is not politic, and constitutionally and economically right, will avail them in the end. Until they fully materialize, the effects of organically unsound plans are always missed by these men strong in words, but lamentably weak in logic and constructive ability.

The President of the Congress (Mr. E. L. Poulton) spoke of the exhaustion of trade union reserves through the futile fight there has been against economic laws. He described these economic laws as being inexorable. He denounced the revolutionaries; and yet almost in the same breath he himself advocated an assault upon those economic laws, by the overthrow of the capitalist system and the setting-up of a form of socialistic State. Then he would obliterate the results of improved facilities for producing goods by having shorter hours for the workers. This would be an excellent method for causing things to stand still, and preventing progress. Cheap production is at the very root of a high scale of employment and good wages; but apparently Mr. Poulton and many others who applauded him cannot grasp this elementary fact in economics. The enormous wave of unemployment to-day is due very largely to excessive costs of production, to the reluctance of many men to give a fair return in work for the money received, and to a large amount of idleness and indifference in essential industries. Of recent lessons of large strikes many men in the labour world appear to be oblivious; and the more thoughtful and far-seeing leaders of trade unions are obviously afraid to open their mouths and speak in no uncertain voice as to the methods and policy of the rulers of other unions. There can be no unity of politic effort while this hesitation continues; there can be no intelligent policy; and there can be no real progress. There was talk as to the coal strike having been one of the most futile in trade union history, and the most expensive. But nothing more was said as to the policy of the miners that has checked industrial progress, and done so much to wreck employment in other industries, as well as to increase the cost of living. Why this fear to speak out plainly and boldly? It is as well known to trade union leaders as to ourselves that many of the excessive costs of industry to-day are due to the fact that the producing costs per ton of coal are four to five times what they were before the war, and that these high

costs are due perhaps as greatly to the lower production per man as to the higher wages paid to them per shift. They know this; they know, too, that the gross uneconomy produced in all industries by unclean coal is owing to the shovelling instead of the forking of the coal produced—a change effected by the miners' organizations to secure payment to the miners for rubbish as well as for coal. Still the reluctance to speak and indict.

The remedy for much that has happened and is happening should be sought for at the root of the trouble; and there the policy of certain trade unions and of the extremist leaders will be found. It is one object of such extremists to prevent employers and employed working together for their mutual interests. They prefer to see a cleavage, and to maintain, and even widen, it; and for the sole purpose of hoping one day to witness the destruction of what they choose to call the capitalist system—a "system" as vital to the maintenance and progress of industry and world commerce as is labour itself. There are equivalents to most things; and there is an economic equivalent of work to pay. It is because work and pay have got out of balance in the coal-mining industry that this industry is to-day in such a deplorable state in the markets of the world, and that a substantial proportion of unemployment exists in the country. This is one of the evils at the root of the industrial troubles to-day. Genuine labour politicians know it; but they are afraid to proclaim their knowledge, and work for the righting of that which they know to be wrong. Instead of this they call upon the Government to provide work or adequate maintenance for every willing worker. The Government cannot provide sufficient suitable work. Full employment can only come from complete obedience to the economic laws which Mr. Poulton rightly described as "inexorable," and which such a large proportion of the "leaders" of the workers have set themselves the task of transgressing, with, at every move, fresh trouble for those they "lead." What they are doing is to ask the Government to provide for something which they themselves have been largely instrumental in bringing about; while the policy should be to right-about-face, and work to rehabilitate the sources of employment. But this is the policy that is eschewed.

The same men also talk loosely of wages being based on the cost of living. Wages cannot permanently have the cost of living as a foundation. There are several other factors that have to be considered. Important ones are production, and the wages that an industry can afford without losing its foreign markets. To have wages for ever based on the cost of living would mean progressive industrial stagnation or retrogression. It is stagnation and retrogression that labour extremists have by their policy brought about. Wages must have relation to work, if the home industries are to succeed, and employment is to be maintained. In the cost of living, light, heat, and power come in—all three in industry, and all three affect domestic life in greater or less degree. But while the costs of coals, through low production and high wages, are what they are, coal must be dear, and so must be light and heat, whether the heat be obtained from solid fuel or gas. We see that some of the learned ones of the daily newspapers are talking of the price of gas coming down, with a small reduction in the price of coal. But with the stagnation of industries and restricted demands from abroad, the secondary products of coal carbonization have fallen greatly in their values; and this fact affects adversely the position of the gas industry. The reduction in the price of coal, such as it is, is but a modicum of the loss of revenue on secondary products. Had all industries to-day been able to work at their maximum capacity, and the demand for the secondary products of coal carbonization been at a high level, things might have been different in the gas industry. With high prices in their purchasing markets, and low ones or short demand in their bye-products markets, gas undertakings cannot reduce the price of their primary product. Coal has to come down much more in price before the losses on secondary products receipts are counterbalanced. The price of coal is subject to the production of the miners, and the relation of costs (including wages) to that production.

This question of trade union policy in respect of work and pay is more important to industrial workers than anything else. It is far more important than the question of the conduct of industrial disputes. There was discussion at the Congress which showed that many leaders are desirous of doing something to avert strikes which have such widespread disastrous effects on the workers in most industries as the long and useless miners' strike, which has done so much to raise the level of unemployment, and to cripple not only trade unions, but industries. The representatives of some of the stronger unions, however, object to put themselves under the domination of any superior labour body as to the manner and methods of conducting their own policy in seeking to acquire their own special aims and objects. A good proposal was therefore knocked on the head. It is clear from this that federations, alliances, and international agreements are only formed or welcomed by some trade union men for the purpose of producing militant strength; but when it comes to the exercise of combined power to examine into the wisdom of the propositions of individual unions, and to try to maintain peace, then such federations, alliances, and international agreements are considered undesirable. This is the position. The trade union movement will never achieve all it might do until it directs its policy to the improving of the industrial position, and making improvement the basis of claim to participate in its rewards. Such policy would do more to lessen unemployment and to maintain wages than the absurd work of the visionaries who have done so much to produce the present deplorable conditions. We had quite hoped that the recent lessons from the industrial world would have resulted in the issue from the Congress of a saner and bolder policy. But things are very much where they were before, through a disinclination to get at the root of the prevalent industrial state, and to operate there. But even the best of men in the trade union movement are apparently afraid openly and persistently to attack the false policy of those who are in quite another street in knowledge and shrewdness.

The Carbon Monoxide and Inerts Reports.

The Fuel Economy Committee of the British Association had not much to say in their annual report respecting the inquiries by the two Departmental Committees, and nothing at all as to the results of the investigations. Though both the Committees were aware that a majority of the members of the Fuel Economy Committee (some of whom were not particularly qualified to form an opinion) were in favour of a 20 p.ct. restriction of carbon monoxide, and a limitation of inerts, the fact did not influence them into coinciding with those views. A note is specially made that three members of the Committee—Messrs. E. V. Evans, W. H. Helps, and H. James Yates—were of opinion that, in view of the provisions of the Gas Regulation Act for the future sale of gas on a thermal basis, gas undertakings should be allowed a free hand in regard to carbon monoxide and inerts.

Borings for Oil.

The Government oil-boring enterprises are not yielding good results. One after the other, they are being abandoned. This is not the fault of the Government. Oil is necessary to a country's daily existence and work; and it is very essential that during war the country should be as independent as possible of shipments across the seas. We found this out during the war, when the Government were urged to bore for oil by one camp of advisers strong in belief of success, while another camp were equally convinced there was no subterranean oil in this country that it would pay to get. However, it was thought that trials ought to be made to prove the matter; and it looks as though those who disbelieved are going to have their disbelief confirmed. At present only two borings are being continued by the Government through its petroleum managers. One of these is at Werrington (North Staffs.), and the other the D'Arcy boring in Scotland. The several wells in Derbyshire are about to be plugged; while the Apedale one in Staffordshire has also been abandoned. At the West Calder well in Scotland, boring has been suspended for some time; the well being already down upwards of 4000 ft. There are expectations, however, that this well may be carried somewhat deeper.

Daylight Saving in Winter.

We have "daylight saving" in summer; why not in winter? It can be had, and that without any alteration of the hands of the clock. Dr. C. W. Saleeby, F.R.S.Edin., pointed out the way in an article contributed to the "Daily Telegraph" last Wednesday. More light in winter is to be obtained by the simple process of utilizing means of obtaining heat that do not produce smoke, and so do not interpose an obscuring medium between the source of

daylight and our urban areas. Dr. Saleeby reckons that 40 to 60 p.ct. of urban sunlight is obstructed in winter by the barbarous misuse of our precious heritage of soft coal.

Coal Output and Exports.

Coal output is not being maintained and increased as we should like to see it. But this is probably due to the already overcrowded facilities for handling coal, and the sluggish buying which gives little relief to these facilities. The output in the week ending Sept. 3 was only 4,143,900 tons, or about 40,000 tons better than in the preceding week; but approximately 200,000 and 400,000 tons worse than in the weeks ending respectively on Aug. 20 and 13. On the other hand, the export trade is being developed as rapidly as circumstances will allow. In August, the shipments constituted 80 p.ct. of the value of our exports, which is the same percentage as during the corresponding month of 1913. But this is upon value, not tonnage. In August, 1913, the average value was 13s. 10d. per ton. Last month it was 36s. 6d., and in July 38s. 3d., which figures compare with 87s. in August, 1920. At current prices, more has to be exported in order to secure the revenue. Last month 3,103,000 tons were shipped, or about 68 p.ct. more than in August, 1920. But in August, 1913, the exports reached 5,819,000 tons. Buyers abroad, however, are still complaining of prices, which are restricting business. How much the country has lost this year on coal exports can be judged by the quantity shipped (excluding bunkers) in the eight months. In that period this year, 9,945,000 tons were exported, compared with 18,376,000 tons in 1920, and 48,321,000 tons in 1913. These figures should be studied by the miners; and they should ask themselves the reason or reasons for such an enormous difference.

Industrial Uses of Gas.

On another page, some particulars are given, from the Presidential Address of M. Edouard Kaeuffer to the Société Technique du Gaz, as to the development of certain operations of the gas industry of France during and since the war. Figures are given as to the development of gas consumption for industrial purposes. The highest percentage increase has been in chemical works (276 p.ct.); glass-works come next; then engineering shops. Dye-works exhibit the largest consumption, and the lowest but one percentage increase. But the consumption totals of chemical works, motor works, and engineering shops have been brought almost to a corresponding level.

Losses Sustained during the Coal Strike

Unsuccessful have been the efforts of the National Gas Council to bring about the recouping of the gas industry for the losses sustained during the coal strike by the purchase of foreign coal and substitutes, in order to maintain the supply of gas to the community, and thus render a considerable public service during the stoppage of coal supplies. It is naturally disappointing to the Council to have to report that the Board of Trade cannot see their way to advise assistance in this matter; and it will be to the industry generally. Information is being conveyed to the Board to this effect, together with the hope that, in the event of a similar emergency, more considerate treatment will be forthcoming from the Government.

Gas Coal Position.

The buying and selling of gas coal is still going on mostly in the open market, and not under contracts. Gas undertakings with their own railway wagons or collieries have been scoring during these times of accumulation at the collieries and the ports. Many buyers who have been searching round have found that prices between different collieries vary somewhat; and they have taken advantage of this. At the same time colliery owners have been quietly warning buyers that they must not expect any considerable reduction in prices, as now only a lowering of the costs of production would make this possible. Gas undertakings abroad are now reported to be coming in as buyers, and so more is being done in shipments of gas coals.

Unemployment and Productive Work.

Other than in the case of works on new sites and distribution improvements and extensions, we do not see that the gas industry can take any considerable advantage of the scheme of the Cabinet Committee on Unemployment; but all who can help to afford relief work, we are sure, will receive the sympathetic commendation of Sir Alfred Mond, the Chairman. For providing employment, there are two branches of work contemplated—non-revenue and revenue producing. The latter is the branch in which the gas industry will be concerned. In approved cases, grants will be paid by the Government, equivalent to 50 p.ct. of the interest on the loans raised for a period of not less than ten years in respect of expenditure on schemes actively commenced before Jan. 1, 1922, provided that such expenditure is incurred within the period ending March 31, 1923. These interest grants will be paid for a period of five years. Not much time is allowed before the work has to be commenced; so we are afraid that the bulk of work that can be thrown into the pool by the gas industry will not be large.

PRODUCTION AND USE OF BENZOLE AND ITS HOMOLOGUES.

A Research Committee Appointed.

A Joint Research Committee has just been formed by the National Benzole Association and the University of Leeds for the purpose of carrying out research into the production and use of benzole and its homologues. The Association (readers are reminded) is concerned with the production of crude and refined benzole for use as motor spirit or in any other way; and, according to its constitution, one of its objects is to carry on, assist, and promote investigation and research.

The term "benzole" is here used in the widest sense, to cover benzene, toluene, and other substances which enter into the constitution of motor spirit; and so the whole of the carbonization industries of the country—including primarily bye-product coke-oven plants and gas-works—are interested in the objects of the Association, which has, therefore, a wide and influential membership. The variety of carbonization and gasification processes coming into operation at the present time, each with its own conditions of operation, in addition to what may be called the standardized methods of production of the bye-product coke-oven and ordinary carbonization plant, taken in conjunction with the increasing demand for light oil in the United States and other petroleum producing countries, and the consequent limitation of their capacity for export, make it very necessary from several points of view that this country should place itself in as strong a position as possible with regard to the home production of light oil and motor spirit. It is believed that one of the best ways of doing so will be to investigate the chemical possibilities in this direction of home industries, and to utilize to the fullest advantage the bye-products obtainable from coal.

To do so adequately requires investigation on a more extended scale; and the commercial enterprises concerned have plenty of work of this kind before them. There are, however, many important problems which, concerning the industry as a whole, can it is believed be best attacked by joint action. In this case not only members of the Association drawn directly from the industry but members of the staff of the Leeds University occupied with cognate matters are to enter into co-operation. In doing so they are following the precedent which has been established already by the University of Leeds and the gas industry, in the formation of the Joint Research Committee which has now been in existence for many years, as "JOURNAL" readers are fully aware, for the investigation of the problems of the gas industry, and which has published a number of reports bearing upon these problems.

The new Committee will be constituted on similar lines, with equal representation from the University and the Association. Work will be carried out under the direction of the Committee and the supervision of Prof. Cobb on problems of importance and urgency, and reports will be published at intervals embodying the results. The initial membership of the Joint Committee is given below:

J. W. Cobb, C.B.E., B.Sc., Professor of Coal Gas and Fuel Industries.
J. B. Cohen, B.Sc., Ph.D., F.R.S., Professor of Organic Chemistry.
A. G. Perkin, F.R.S., Professor of Colour Chemistry and Dyeing.
Granville Poole, B.Sc., M.I.M.E., F.G.S., Professor of Mining.
A. Smithells, C.M.G., B.Sc., F.R.S., Professor of Chemistry and Pro-Vice-Chancellor of the University.
W. G. Adam, B.A. (Oxon.), F.C.S., M.S.C.I.
T. Howard Butler, Ph.D., M.Sc., F.I.C.
S. Henshaw, F.I.C.
S. A. Sadler.
E. W. Smith, D.Sc., F.I.C.

Intimation has been received of the death at Masterton, New Zealand, of Mr. John Herdman, formerly for many years the Manager of the West Kyo Gas-Works, Annfield Plain. Deceased, who emigrated seventeen years ago, was a native of Whittonstall.

NATIONAL GAS COUNCIL.

Meeting of the Central Executive Board.

A MEETING of the Central Executive Board of the National Gas Council was held on Tuesday last week, at No. 30, Grosvenor Gardens, S.W. In the unavoidable absence of the Chairman and Vice-Chairman of the Council, Mr. J. H. ELLIS (Plymouth) was voted to the chair.

AN EXPRESSION OF SYMPATHY.

The Board recorded their sympathy with the Vice-Chairman (Mr. Alderman Phillips) in his recent illness, and their hope for his speedy restoration to health.

LOSSES SUSTAINED THROUGH COAL STOPPAGE.

It was reported that a deputation from the Council waited on Sir William Mitchell-Thomson, Bart., M.P., at the Board of Trade on July 19, asking that steps be taken to recoup the gas industry for its losses in connection with the purchase of foreign coal and substitutes during the coal stoppage. At the interview it was pointed out that it was only at the earnest request of the Government that many gas undertakings had refrained from closing-down altogether, and had continued to maintain the gas supply in many cases at a serious loss to the undertaking. It was disappointing to have to report that the Board of Trade, now that the coal strike was over, could not see their way to take any practical steps to assist the gas industry to meet the enormous financial losses that had been sustained. It was agreed that the Board of Trade should be informed that this decision was a source of great disappointment to the industry, and that the hope should be expressed that, in the event of a similar emergency arising, more considerate treatment should be forthcoming from the Government.

COAL.

Reports from all quarters showed the continued downward tendency of the market, especially for slacks. Further discussion of the matter was postponed until the next meeting of the Board.

CARBON MONOXIDE AND GAS INCOMBUSTIBLES.

The reports of the Board of Trade Committees on these two subjects were received by the Board with much satisfaction.

MODEL BILL.

Amendments to the Model (Gas) Bill were read, as suggested by the Council, with the intimation that the Lord Chairman had allowed it to be understood that these would find a place in next session's Model Bill.

OVERDRIVING OF METERS.

The conclusion reached as a result of circularizing members of the Central Executive Board for their opinion upon the report of the Council's Parliamentary Agent on this matter was that no advantage would be gained by the insertion of a new clause in the Model Bill. The Gas-Works Clauses Act of 1871 was considered to afford sufficient protection to gas undertakings. In this connection, it was mentioned that the Lord Chairman had agreed to the inclusion in the Model Bill of a clause with regard to the provision of a non-return valve where high-pressure air is employed. Further, that where the Council's clause regarding a non-return valve has been included in Special Orders under the Gas Regulation Act, the Board of Trade had allowed the clause to stand in its present form.

DRAFT REGULATIONS UNDER THE FACTORY AND WORKSHOP ACT.

It was agreed to acquaint the Home Office that, with a few drafting amendments on the part of the Council, the Central Executive Board were prepared to accept the regulations as amended. The suggested amendments were read to the Board, and approved.

LIGHTING IN FACTORIES AND WORKSHOPS.

The second report of the Departmental Committee of the Home Office on Lighting in Factories and Workshops was considered, and the recommendation dealing with the prevention of "glare" was referred to the Institution of Gas Engineers and the British Commercial Gas Association for investigation and report.

WORKMEN'S COMPENSATION INSURANCE.

It was reported that so far only 195 undertakings had supplied completed questionnaires with regard to this matter, and that until the remaining members had returned the information asked for, it was not possible to arrive at really reliable figures. Information to hand, however, proved beyond a doubt that the gas industry had hitherto been paying far higher premiums than the risk involved warranted; and it was confidently asserted that the Council were in a position to assist gas undertakings to effect an enormous saving in this direction. It was decided to urge those gas undertakings that had not supplied the information asked for by the Council to forward this as soon as possible.

STANDARDIZATION OF COOKERS.

This matter was considered, and the recommendations made by the Council's Standardization Committee were approved.

SULPHURIC ACID.

Protests were lodged by various districts against the high price of sulphuric acid, which it was declared would result in the gas industry ceasing altogether to manufacture sulphate of ammonia. In many cases, smaller undertakings had already taken this course. It was resolved to communicate immediately with the acid makers, pointing out that the gas industry would be quite prepared to assist them to increase their output of acid, which had fallen to such a considerable extent, if, on the other hand, the acid makers would meet the gas industry in the matter of price. By co-operation of this kind, it was felt most strongly that both the acid makers and the gas industry would benefit by a stimulation of trade.

FEDERATION OF BRITISH INDUSTRIES.

It was agreed to renew the annual subscription to this body; and the Council's representatives on the Grand Council of the Federation were reappointed.

TERMINATION OF THE WAR.

The Order in Council proclaiming Aug. 31 as the termination of hostilities was reported.

ANNUAL MEETING.

Wednesday, Dec. 14, was fixed tentatively as the date of the annual meeting of the Council.

ELECTRICITY SUPPLY MEMORANDA.

Per Head of Population.

OUR old friend "Meteor" of the "Electrical Times" refers to the calculation recently made in the editorial columns of the "JOURNAL," as to the *per capita* use of gas, taking the new census figures as to population, and the last available official returns of consumption for statutory gas undertakings [see *ante*, p. 481]. Now "Meteor" will notice the use of that word "statutory," because the figures available do not include the non-statutory concerns, nor the otherwise privately owned gas-producing stations, nor do they take in any gas other than that of the town variety. Only gas supplied by statutory gas undertakings, and used for light, heat, and power, is included. He alludes to the difficulty of getting out anything but the roughest approximations in matters of this kind. The only possible way would be for each local gas and electrical engineer and manager to work-out his own figures, in order to obtain anything approaching exactitude. "Meteor" states that the Census of Production for 1907 made a shot at the figure, and produced a total of 2388 million units, which work-out at about 53 units *per capita*. In our contemporary's own "Tables of Costs," there is a column headed "Units Sold for Private Supply per Head of Population." Pride of place belongs to Kilmarnock, with 365 units per head. Cambuslang has only 8 units per head; and there is one station with only 5·6 units. Towns whose consumptions exceed 100 units per head are in a small minority. These figures do not take account of units used for traction and public lighting, or of units privately generated. However, taking the 53 units mentioned earlier, these only represent 181,260 B.Th.U.; whereas, at 480 B.Th.U. per cubic foot, the 4846 c.ft. of gas per head of the population works out to 2,326,080 B.Th.U.

Where Electricity is Cheap Enough!

Electrical writers seem to favour the idea that householders have heavy purses, and can stand all sorts of expense in order to bestow custom on the electricity supply industry. It is an egregious mistake. In the matter of heating, for example, the notion is quite a prevalent one that householders generally will be more than pleased to have coal or smokeless fuel cellars and fireplaces, and at the same time utilize electricity for intermittent heating and for putting a "top" on hot water which can be given the full heat required by the more economical process primarily used, and with gas, coal, or coke as the heating agent. "Electrical Industries" alludes to the article in "The Times" on smokeless fuel, by Sir Napier Shaw, which was commented on in the "JOURNAL" for Aug. 31 [p. 480]. Our contemporary catalogues the several purposes for which heat is required in an ordinary dwelling-house; and it then makes this sapient remark: "Where electricity is cheap enough, it can be advantageously used for all these purposes, because it is the only source of heat which is under perfect control, and capable of efficient storage." "Where electricity is cheap enough!" Where is that? Cheapness has relation in this case to the cost for which the same work can be done by other agents. And the cost in both money and time at which electricity can perform the several domestic operations is so far removed from economy that the main difficulty with which the electrical people have to contend is to get householders to tolerate its use for heating. The reasons adduced by our contemporary for its employment are also interesting, though absurd. "It is the only source of heat that is under perfect control and capable of efficient storage." Take an oven or hot-water plate. The heats are under "control" at three or four fixed points—nothing between and nothing beyond. This is not perfect control. And as the elements depreciate, the heat efficiency deteriorates. This is not perfect control. And as to the capacity for efficient storage. How can electricity as a "source" of heat be

efficiently stored? If the heat generated by it is "stored," there are constant losses, which is not "efficient storage." The highest efficiency in storage is obtained by the ability to store the agent producing the heat, and not the heat itself.

An Invitation to Sir Napier.

However, our contemporary admits that current prices of electricity suggest that a combination of electricity and smokeless fuel is the best solution for the time being of the domestic heating problem—electricity being used for cooking and intermittent heating, and coke and anthracite for the steady heating. It invites Sir Napier Shaw to make a close study of the all-electric and the semi-electric solutions; and, when he has done this, he will discover that "we do not need to wait for the production of coalite or carbo, or any speculative form of smokeless fuel, before we can hope to attain the smokeless age." But he will have a difficulty when he considers the ratio of cost to heat value in the case of electricity. Also when he comes to study the relative efficiencies of gas and electricity in utilizing our coal resources, he may have a shock from which he may never recover sufficiently to enable him to advocate in the national interests either the all-electric or the semi-electric propositions.

"Relative" Prices.

Correspondence has been proceeding in the "Sheffield Weekly News" regarding fuel; and one writer, extraordinarily visionary, and without fundamental knowledge of what he was talking about, suggested the rapid development of electricity for "reducing" fuel costs. Of course, the poor fellow had not even an elementary acquaintance with the bulk losses of heating value between the furnace of a steam-boiler and the dynamo, and a continuing drop until the electrical energy gets to its destination, resulting in only 3 to 8 p.ct. of the original thermal value of the coal or other fuel reaching the electricity user, while the poor old barbaric use of raw coal in a grate can give 20 to 24 p.ct. efficiency. The way of reducing fuel costs electrically is not very clear. An ex-soldier joined in the correspondence, and asked whether electric heating, cooking, vacuum cleaning, &c., were really practical and financially sound at 3d. per unit? "Electrical Industries" says the obvious answer is that everything is relative in this world. Coal is now three times its pre-war price; and electricity to-day at 3d. per unit is as good as at 1d. per unit in 1914. Again, gas is at least twice as dear as before the war, and so any consumer who did not think 1½d. per unit too dear for electric cooking and heating in 1914 need not boggle at 3d. per unit to-day. This is how our contemporary looks at the matter. It is not how the public regards it. To-day where gas is 5s. per 1000 c.ft., of 480 B.Th.U. quality, 24,000 B.Th.U. can be purchased for 3d.; while electricity at 3d. only gives the user 3420 B.Th.U., or 1140 B.Th.U. per 1d. Gas at the price named gives him 8000 B.Th.U. per 1d. Before the war, the gas consumer at 2s. 6d. per 1000 c.ft. got 16,000 B.Th.U. for 1d.; the electricity consumer 3420 B.Th.U. To-day the consumer gets seven times more B.Th.U. for 1d. from gas at 5s. than from electricity at 3d.; and before the war about five times that given by electricity at 1d. per unit. With gas at 1s. per therm, 25,000 B.Th.U. are supplied for 3d., or 8333 B.Th.U. for 1d.

Affinity of Sparks and Power Stations.

It is a phenomenon which should occupy the attention of the *savants* who attend the meetings of the British Association as to the power of allurement for sparks that electricity stations and other places have where there are electricity generation and use. To most ordinary minded people this may appear to be bunkum; but according to the Electrical Press, it is a fact. We are constantly reading in the pages of our contemporaries when a fire occurs where there is electrical plant that it is believed the fire was caused by a spark. There was a fire recently at the Exeter electric power station. The "Electrical Review" says it is "believed to have been caused by a spark." It may have been so in this case; but really it is peculiar how many of these fires are supposed to be spark generated. It used to be cigarettes; but the declared propensity of cigarettes for fire-raising has fallen into abeyance for the time-being in favour of the lively spark.

Live Screw Caps.

Information has often been given in Home Office reports on the use of electricity in factories as to the danger of electricity at voltages ordinarily supplied. Voltages of 220 to 230 are quite common; but users do not realize that there is danger in current at this pressure. A young electrician named Braithwaite (he was only 24 years of age) was lately examining a defective lamp fitting at the Thornhill station of the Yorkshire Electric Power Company, when he received a shock, and died. The Coroner at the inquest returned a verdict of "Death from shock by being accidentally electrocuted while fixing an electric lamp." He stated that the lamp was a dangerous one. It was one of the screw-cap variety, with a one-hole switch, and the cap was alive with a voltage of 220 to 230, alternating current. Alternating current is earning an unenviable reputation for the length of its list of victims. The electrical people will take to heart the view of the Coroner that it is a question for all concerned to see how far the danger of the live screw-cap can be obviated. If an electrician who is supposed to know all about these dangers can be so easily electrocuted by such simple means, then the less initiated lay users ought to be warned against a danger that may lurk in a defective lamp.

Cheap Wiring.

Many proprietary systems of so-called cheap wiring (which means cheaper than the expensive wiring run in electrically continuous tubing) have been invented, and placed on the market. They have their users; but the number of electrical men who do not believe in them would be found, if count could be made, to be in the ascendant. What is noticeable is that no respectable and responsible contractor ever thinks of putting one of these cheap systems of wiring into good-class property; they are reserved for the more plebeian property. Even there their vogue is not very large. "Electrical Industries" calls attention to the historical fact that, from the earliest days of electric lighting, the initial expense of wiring has been a serious obstacle to the adoption of supply. It is more so to-day with wiring costing not £1 a point, but two or three times this sum. Then the confession is made that during the last few months contracting work has been, to put it mildly, on a very limited scale. Despite reduced wages and the expectation of a revival in business, our contemporary opines that even the most sanguine prophet will not declare that the installation orders of the next year or so will be more than a fraction of those required—by whom?—"to satisfy all the people who are ready and anxious to take a supply." That is rubbish. If people are "ready and anxious" to take a supply, they will do so; that they are not "ready" and not "anxious" is proved by the fact that they are abstaining from giving orders for wiring. At one time, it was said that the electric light would win on merit alone, altogether apart from cost. But the truth is penetrating the minds of men reluctant to believe that cost could be an obstacle to electric lighting that they have been mistaken. Even now some believe that vigorous propaganda would be worth carrying on, "based solely on the fact that the electric light is worth having in spite of the expenditure it involves at the outset." "Electrical Industries" says the real problem is to get hold of the thousands upon thousands of unwired houses on the routes of existing mains. Publicity would, it thinks, do a great deal towards this end; but a material reduction in the cost of wiring would be an invaluable aid. Every cable firm has a system which is claimed to be cheap and easy to instal. But the disclosure has to be made that "the installation world is not yet convinced that any one of these systems is the ideal." The "Electrical Contractor" has taken up the matter, and urges that not until there is a standard system of wiring can there be really cheap wiring. So it proposes a Consultative Committee of the Electrical Contractors' Association for the purpose of determining exactly how the cheapest possible wiring of ordinary houses should be accomplished. The feeling of the contractors is that the uniformity necessary to cheapness will never be brought about by the manufacturers themselves. The manufacturers naturally prefer specialities and individual selling points. Nevertheless, it is thought that anything which reduces wiring costs will bring about an accession of business which will compensate for any sacrifice of individual rights. Anyway, "Electrical Industries" thinks it is arguable.

Selling Service.

In the course of an article in which he sets out to show the readers of the "American Gas Journal" what can be accomplished by an up-to-date salesman, Mr. Frank V. M'Cormick argues that one of the great reasons why gas lighting has never been more popular than it is can be found in the fact that gas-burners and not gas lighting have been sold. On the other hand, one reason why so many gas-ranges are being used is because the demonstrators have sold gas cooking. It was not the man who took the order for the range that performed the most valuable service to the gas company. It was the woman who went around and showed people how to use their gas-ranges, how to cook on them, how to get the best results from the gas used. They were doing modern selling. The demonstrator, indeed, was giving information really worth while; but the very fact that she was giving information rather than making use of persuasion has at times caused to be overlooked the truth that she was really doing more than any other person on the sales force to sell gas. For more than a generation gas companies have been employing salesmen; and yet the attitude the public take towards the companies in most cases to-day indicates that the service the company render to the public has never really been sold. Appliances have been sold, and people have been led to believe that gas is a necessity; but they have not had it made clear to them that the company are rendering a service that is of tremendous value to the public, and are doing so at a surprisingly low cost. To be a really efficient salesman, a man must first be a good gas man.

Gas Engineers to Visit the Olympia Exhibition.—A visit by the Institution of Gas Engineers to the Shipping, Engineering, and Machinery Exhibition at Olympia will take place on Friday afternoon, Sept. 23, by invitation of the exhibition authorities. Tea will be provided in the *café* near the main entrance, at 5 o'clock. Members of District Associations and of Junior Gas Associations are also invited to attend. Acceptances should be addressed to the General Manager, Mr. F. W. Bridges, at Olympia, W., and the invitation card produced at the entrance.

R. & A. MAIN'S NEW SEASON'S GOODS.

THAT this is a world of change has never been more apparent than at the present day. Old standards and ideals are being challenged and changed; and the resulting altered circumstances are causing adaptations and reconstructions everywhere. Our own industry shows evidence of this. The causal product "gas" presents a different aspect with practically every undertaking; new carbonizing methods, fresh distributing schemes, and changed financial procedure, have been suggested, investigated, and adopted; others are in the transition stage; and others still are being abandoned. It is only logical, then, that a changed product—manufactured by changed methods, and distributed in a changed fashion—demands changed apparatus to utilize it to its utmost advantage; and elasticity in adjustments is essential to deal with so heterogeneous a commodity.

Realizing, then, in their capacity as gas cooking and heating apparatus manufacturers, that "the old order changeth," Messrs. R. & A. Main, Ltd., have been engaged since the removal of war-time restrictions in producing appliances that will best meet the present-day varied requirements of the gas industry. Their investigation and research work have indicated that these requirements are: Apparatus of a robust and economical character, adaptable as regards quality and pressure of gas, with low maintenance costs, and designed with an eye to the future, so as to be easily modified to meet further possible changes. These have been their aims in introducing their new season's fires, some particulars of which are now to hand.

The basic unit of these new fires is the Main fuel-plate. This plate not only carries the brick, burner, injector, and radiants, but also ensures that these essential parts register accurately one with the other. One screw secures the burner, which is supported rigidly by a three-point fixing; and each burner nozzle locates itself in its respective hole in the fuel plate, ensuring that the flame will be concentric with the radiants. The fuel-plate correctly positions the radiants and also permits of the removal of the burner without disturbing them. This is a point that will appeal to the desire for low upkeep, as not only is time saved, but the risk of breakage is greatly reduced.

The Main patented and improved grid-burner gives intense, well-aerated, and silent flames, ensuring the maximum heating effect with the minimum amount of gas. There are no parts to break or burn-out, and the burner is fool-proof. The grids are fitted in the burner cover, rendering them easy of access in the event of cleaning being necessary.

The injector is a model of effectiveness. It gives a fully aerated flame, with a long range of fine adjustment. The simplicity of its construction and operation makes it almost impossible for it to get out of order, and ensures correct adjustment being made with the greatest ease. Two screws, accessible from the top of the fuel plate, make its removal and replacement easy, and at the same time render certain its correct location in relation to the burner. Further, the new Main fires are all fitted with fenders of useful proportions, providing ample reflecting surface, enhancing the appearance of the fire, and concealing all the fittings.

The problem of supplying a really satisfactory boiling burner with a gas-fire has been studied in several ways, but until now with only a modicum of success. The inartistic appearance, awkward situation, insufficient support for the pan, the flimsy construction, and the discoloration of the fire-front have all militated in varying degree against the general adoption of such fittings. These drawbacks have all been overcome in the new Main trivet boiling burner. This is fitted in the front fender or trivet, which provides a firm support for the pan. When not in use, a loose top plate conceals the burner and fittings. All fittings for the trivet are interchangeable—the same fuel-plate serves either an ordinary fire or one with a boiling burner. To convert to a boiling burner fire, all that is necessary is to screw an extra cock to the injector, fix the boiling burner by one screw to the fuel plate, and drop the burner fender into position. A removable fuel guard effectually protects the radiants from being broken by the pan. The burner, injector, and pan are in correct juxtaposition at all times, and the fitment is most efficient and durable.

The above-mentioned improvements are embodied in Messrs. R. & A. Main's new "Author" series of fires, which are self-contained but can be used as built-in grates if desired.

The house of Main has been established now for nearly half-a-century; and, as an independent and progressive firm, it believes in moving with the times—anticipating the requirements of the gas industry and keeping in the forefront as regards the standard of its manufactures. It is very favourably situated in that it has distributing centres for London and the South, the Midlands, and the North, from each of which a fleet of motor lorries delivers goods along the principal routes.

Until recently, practically all gas appliances were installed as an afterthought, and as an adjunct to some other apparatus. This fact has been one of the most limiting conditions in the designing of gas appliances; but the advantages that gas offers by its cleanliness, certainty, and labour-saving qualities are gradually forcing public opinion to give gas appliances the consideration that they deserve, and gas apparatus at the present day is being demanded as a permanent fixture, and gas (slowly yet surely) is being regarded as the essential fuel. In this changing period, Messrs. Main provide a unique range of gas-grates to suit all tastes, ideas, and requirements.

LIGHTING IN FACTORIES AND WORKSHOPS.

EMPHASIS is laid upon the importance of adequate and suitable lighting in factories and workshops—both from the point of view of the health and safety of the worker, and from that of the general efficiency of the work—in Welfare Pamphlet No. 7, entitled "Lighting in Factories and Workshops," which has just been issued by the Home Office. It is published by H.M. Stationery Office, at the price of 4d. net.

The fundamental requisites of good lighting are considered under the two headings of adequacy and suitability. Circumstances in most cases render it necessary to determine the amount of illumination that may be regarded as adequate (1) for affording safe access from one part of the place to another, and (2) for the efficient carrying-on of the work. The first of these has been studied by the Departmental Committee on Lighting in Factories and Workshops; and numerical standards have been recommended for adoption as fulfilling the minimum requirements. Briefly, these are as follows—the measurements to be made on a horizontal plane at floor level: Over the working area, or that portion of the floor occupied by, or in the immediate neighbourhood of, the machines, benches, plant, or material at which the operatives stand or sit in execution of their work, including the gangways and alleys between or around such working places, 0·25 foot-candle. [Exception is made in the case of iron foundries, for which, owing to the dark surroundings and want of contrast, a standard of 0·4 foot-candle is recommended.] All other parts of the factories and workshops over which persons are liable to pass (passages, stairways, and lobbies), 0·1 foot-candle. In all open spaces in which persons are employed during night, and in dangerous parts of a regular road or way forming the approach to any place of work, 0·05 foot-candle. These standards are, it is pointed out, to be regarded, not as embodying ideal conditions, but as suitable for legal minima. A workroom, for instance, with a uniform illumination of 0·25 foot-candle would be very inadequately lighted. Owing, however, to the diversity of illumination existing with any system of lighting, a given minimum means a much higher maximum and average. As to the illumination required for actual work, no recommendations with regard to standards of illumination needed for different processes have yet been made by the Committee; but the results of certain preliminary experiments were embodied in their first report (issued in 1915), and this portion of the subject is dealt with at some length in the present pamphlet.

The question of suitability of lighting is then discussed, on the lines of the second report of the Committee [reproduced on p. 392 of the "JOURNAL" for Aug. 17 last], who considered the subject under the three headings of glare, shadow, and constancy, and set forth requirements in these respects which were formulated with a view to their inclusion in an order defining suitable lighting for factories and workshops. Other sections refer to methods of artificial illumination and causes of unsatisfactory lighting; and then there are indicated briefly, in the form of questions, the various ways in which the lighting of a factory may be defective.

The Selection of Fuels.

A series of papers relating to the selection and use of fuels and equipment for industrial heating operations have been forwarded by the W. S. Rockwell Company, of No. 50, Church Street, New York, whose literature on the subject of heat-treated products was noticed in the "JOURNAL" last month [*ante*, p. 376]. The papers of which the present Bulletin [No. 231] is composed deal respectively with factors governing the selection of fuels, comparative fuel prices on a B.Th.U. basis, the comparative heating value of industrial fuel gases, the composition of these gases, and the utilization of fuel resources. The papers voice some sound practical views on the subject, which the firm have derived from their experience as furnace engineers. It is pointed out by them that the selection of fuels for industrial heating should be based upon appreciation of the radical difference between the price of fuel, on the one hand, and the quality and cost of product resulting from the generation, application, and utilization of heat, on the other hand. A complex field must be surveyed before a proper selection of fuel and equipment is made. The practice of selecting fuel on the basis of thermal value and price is both inaccurate and misleading, unless at the same time proper consideration is given to other essentials which largely determine the suitability of fuel and equipment regardless of price or thermal value. The efficient utilization in suitable furnaces of the right fuel, selected to meet the requirements, rather than the price of fuel alone, must be depended upon to lower the cost and improve the quality of all heat-treated products. The apparent relative economic value of the different forms of fuel on the basis of price at the moment, may be changed in the future, as it has been in the past by the development of better methods of heat application and more efficient apparatus either to make possible a different result or to accomplish the same result at less cost, by decreasing the amount of energy required, without any change in the price. Each paper is accompanied by a chart.

The next general meeting of the Wales and Monmouthshire District Institution of Gas Engineers and Managers will take place at Chepstow, on Wednesday, Oct. 19.

AN UNUSUAL ACCIDENT TO GAS PLANT.

Combustion in the Holder and Distribution System of the Gas Company at Oak Bluffs.

By CHARLES D. JENKINS and EARL H. BARBER, of the Commonwealth of Massachusetts Department of Public Utilities.

IN the Technical Press of America, someone has recently proffered that all that ails the gas industry is that it is dead. Yet the tranquillity of the industry which has led to this diagnosis may not be lethal, but merely a dormant state, like that of a gently steaming volcano, presaging a period of phenomenal activity.

Certainly the gas industry at Oak Bluffs (Mass.) had had a tranquil history until the spring of 1921. Built some time in the nineties to supply a few hundred customers at a popular summer resort, and supplemented later by an electric plant, the use of gas became limited eventually to summer cooking, because light was furnished by the electric plant and the winter residents used coal for both cooking and heating. As Oak Bluffs is a long-established summer resort, the population within reach of the gas plant has not specially increased; so that, with slight changes in the type of equipment, the plant has remained practically as it was first built. It consists at present of the generator, carburettor, and superheater of a 4-ft. water-gas set, a tubular condenser, a shavings scrubber, and four oxide purifiers—all housed in a brick building; and one single lift 36,000 c.ft. holder, with a masonry tank. Its operating season commences about the middle of May, and continues until some time in September, when it is closed for the winter.

In the spring of 1921 the lower course of the holder was renewed. Repairs were not completed until late in May; and as summer residents were already arriving, the Company began filling the tank with water, and preparing to operate the plant. On Sunday, May 22, the water-level in the tank was about 6 ft. below the curb; and the supply, which was being obtained from a small well, was augmented from the municipal main. As the water-level rose, and the crown-plates of the bell bulged upward, a ¾-in. plug was removed to release the imprisoned air.

On Tuesday, May 24, gas was made for the first time; and, without an observation of the water-level in the tank, about 25,000 c.ft. of gas were pumped into the holder. During the day blow-off valves in the mains were opened at several points; and at some residences meter-connections were opened until the gas arrived. Also, some residents opened their fixtures on their own initiative, to determine whether or not gas was available. When work ceased on May 24, the holder indicator registered a content of 5400 c.ft.; but during the night it dropped to a registration of 1000 c.ft. [The registration would be correct only in case the water-line was normal; but there is no record of where it stood. It is known that three days before it was 6 ft. below the curb, that water had been added meanwhile, and that the masonry tank leaked.] Next day, gas production was resumed. One complete run was made, and the apparatus was blown for another. Then something happened.

As the gas maker opened the steam-valve, he glanced through the doorway, and saw the holder trundling rapidly up the guides. He shut the valve, and, stimulated by the clang of falling metal, screwed down the main valve and made for the door. When he reached the street, he found the holder quiet, the negro settlement about the works deserted, and the surrounding fields dotted with the migrating forms of the residents. Not only did the noise of the catastrophe and the shifting of the population affect Main Street, but in the lobby of the Island Hotel, perhaps a quarter-of-a-mile from the gas plant, there was an astonishing detonation under foot, followed by the crash of glass and flying metal. Therefore there was some foundation for the report which shortly after reached us by telephone—that the plant and distribution system at Oak Bluffs had exploded, and that the gas service was at an end.

On the day following, May 26, one of us made a brief inspection of the condition of the gas plant and the meter at the Island Hotel. All the equipment in the gas-house seemed intact. The water-seal in the purifiers was complete; and there was no evidence of splashed water on the purifier-house floor. The holder was a wreck. The guide structure was completely demolished; but the bell, though displaced, was deformed on the northerly segment only, where it had crumpled down on to the curb of the masonry tank. In the tank the water-level was about 12 ft. below the curb. The meter at the Island Hotel had exploded violently; but the short lead pipes which formed the connections were not damaged. The inlet-tube was only slightly sprung; but the outlet tube was nearly separated from the meter. Fortunately no one had been in any way injured by the disturbance.

The significant facts seemed to us to be that the works up to the holder had not been affected; that the holder guide-framing had been wrecked without materially damaging the holder bell; and that a customer's meter on the line had exploded. Also, there was a statement that the holder was elevated and flaming, perhaps one second after attention had been called to it; and the Company's description of their operations, which did not show that the system had been cleared of air.

It occurred to us that these phenomena might have been caused by some customer applying a light to a fixture; for, if his meter contained an explosive mixture, and if the main and holder held a large amount of air, his doing so might explode the meter and light a slow fire in the main, which, on reaching the mixture in the holder, would send it rapidly upwards. The upward movement of the bell would terminate when it had encountered the hexagonally arranged girders which form the sway bracing of the columns; and the impact might destroy the guide structure. The fire would stop at the holder, because the yard piping and the apparatus between it and the generator would contain no air to support combustion.

It is possible that the mixture of air and gas necessary for this sequence did not exist at the time. From the relative density of gas and air, and the probability of low water in the holder, it follows that the holder may have retained a substantial amount of air even after gas had been delivered to some consumers. The fact that some of the customers on the day before the accident had secured a supply of gas, while others further along the same main had not, is evidence of the presence of gas and air in the main on the day before the accident. However separated the two elements may have been at the end of the day, there would have been ample time for diffusion in both mains and holders during the night.

Our experience recalls instances of meters containing a mixture of gas and air which were exploded when an attempt was made to light a customer's fixture; and also the experiments of one of us with the combustibility of mixtures of gas and air showed a rate of flame propagation for a slow-burning mixture as low as 3½ seconds a foot.

A few weeks after our preliminary inspection, the Company reported that the opening of the resort for the summer season had revealed other instances of damaged meters. One of them had exploded with greater violence than that at the Island Hotel; and gas had flamed through the service-pipe for a long period, melting a quantity of soft metal, and blackening the meter. Further, many residents had reported witnessing the accident to the holder, and testified to so great a disturbance that their account, added to the evidence of the newly discovered meter, pointed to a more violent explosion than we had assumed. To examine this new evidence, we visited the plant again on June 15. Since our previous inspection, about one-third of the residences had been opened; but the number of damaged meters was only four. As we did not consider that the evidence of the meters conflicted with the opinion we formed on our former visit, we proceeded to interview those who had witnessed the accident to the holder; but this we soon abandoned for the evidence of the wreckage itself.

From our second examination, we see no reason for revising our original opinion that an explosive mixture flashed-back through some customer's house-piping and meter, lighted a slow-burning mixture in the main (and incidentally some fast-burning mixtures in some meters), and that the flame in the main travelled back to the rich mixture in the holder, which, on its ignition, caused that sedate structure to behave in the lively manner described. But since that exciting event oil-stoves have flocked to town, electric wiremen have been busy, and, whatever may be the condition of the gas industry in general, at Oak Bluffs it is undoubtedly dead. Asked to find a cause of the catastrophe, we think of the unpurged holder placed in service, the partly purged mains, and the inquisitive customers trying their house fixtures with flame for incoming gas.

A Mixed Coal and Oil Fuel.

The Bureau of Mines have, says the "Gas-Age Record," just completed laboratory tests of the efficiency of the Trent process for producing fuel from mixed coal and oil. The results were favourable—the fuel being 95 p.ct. combustible. The essence of the process is to be found in a physical phenomenon which occurs when water and oil are agitated with powdered coal. Particles of oil select particles of coal, almost entirely excluding the water and mineral matter which it holds in flux. The amount of ash removed by the process from low-grade coal in the tests of the Bureau ranged from 30 to 70 p.ct. Using an oil which distils at a lower temperature than the coal, makes possible the reclaiming of the oil, and results in a powdered fuel. The employment of a heavy oil containing much pitch leaves a coke product after distillation, though the coal may have had no coking quality. The operation of the process consists simply in churning the mixture by the aid of paddles; the coal being first crushed fine, to rid it of extraneous mineral matter, and then mixed with water. It has been found that the proper amount of oil is about 30 p.ct. in weight of the tonnage of dry coal; and oil of quite moderate viscosity can be employed. It is anticipated that flue dust can thus be converted into coke; and gas-works tar emulsions can be dehydrated by mixing with powdered coal—the amalgam being retorted for further gas making.

Mr. Henry Roberts is entering business life at Barnsley after 18½ years' service as Outdoor Manager for the Accrington District Gas Board. As a public servant, he has been greatly esteemed. Mr. Roberts has been connected with gas undertakings practically all his life. He commenced with the Birkenhead Corporation, and was at Barry Dock prior to going to Accrington.

"FULL-SCALE" DRAUGHT AND PRESSURE GAUGES.

In spite of the many types of indicating and recording pressure gauges available to-day, gas engineers and chemists still favour strongly, for readings at most points on their plants, simple water-column gauges. This is very natural, having regard to the low cost of such gauges, the absence of any parts likely to go wrong, and the certainty of accuracy they carry with them. There is, however, room for some improvements in the design of even simple water-column gauges, and several such improvements are claimed in the "full-scale" gauges made by Messrs. Walker, Crosweller, & Co., of No. 265, Strand, W.C.

These have very strong glass tubes, mounted in neat iron castings, with a reservoir at the back; and as the area of the reservoir is very large in comparison with the bore of the glass tubes, the readings in the latter are approximately full-scale. That is to say, 1-in. pressure or draught shows as 1-in. on the scale, instead of ½ in. as in an ordinary U-tube gauge. The readings of a "full-scale" gauge are therefore much easier to see and note. Charging these gauges is also a very simple matter, owing to the provision of the reservoir, which is cast at the bottom of the draught gauges, at the middle of the draught and pressure gauges, and at the top of the pressure gauges.

The "full-scale" gauges are made-up for single readings, two readings, and four readings per gauge; the multiple gauges being made-up with castings extended in their width to take the required number of glass tubes, and having a reservoir at the back common to all. Such gauges are, of course, useful for centralizing comparative readings from various points or stages in a process. The illustrations show a "Full-Scale" draught gauge for one reading, and a pressure gauge for four readings.

The ranges offered are 3-in. W.G. draught and pressure, 6-in. W.G. draught, 6-in. W.G. draught and pressure, 6-in. W.G. pressure, 12-in. W.G. pressure, 40-in. W.G. draught and pressure, 80-in. W.G. pressure, and 160-in. W.G. pressure. The 40-in., 80-in., and 160-in. readings are obtained by filling the gauges with mercury instead of with water; and as 1-in. W.G. is indicated by a rise of approximately one-fourteenth of an inch in the mercury column, the readings may still be described as easily noted for gauges of such ranges.

"Full-Scale" gauges for mercury filling are made-up especially to suit, and have a ¼-in. gas-union fixed to the casting at the top of each glass tube, for a tight and durable connection.

Fig. 1.—A One-Point Draught Gauge, range 6 in. W.G.

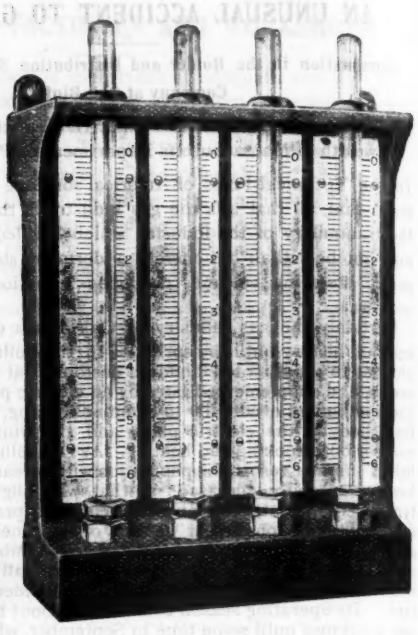
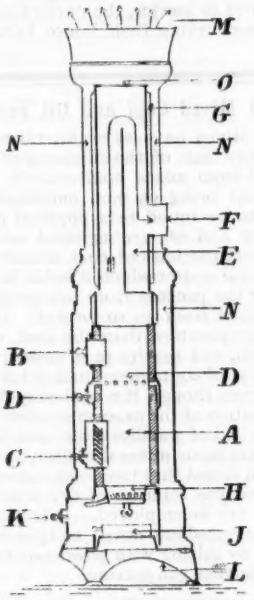


Fig. 2.—A Four-Point Multiple Pressure Gauge, range 6 in. W.G.

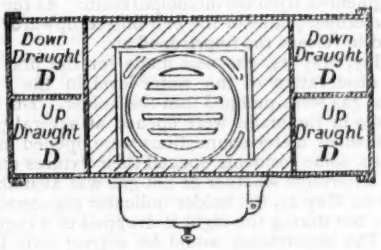
DANISH COKE STOVES.

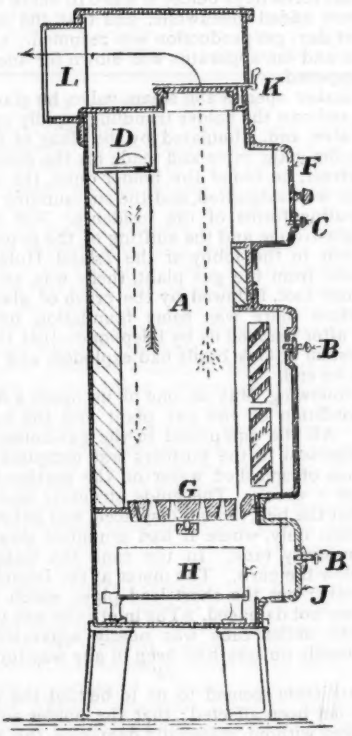
To illustrate the interesting article contributed to the "JOURNAL" columns last week by Mr. F. D. Marshall, entitled "How to Burn Coke," three types of stoves were shown as manufactured by Messrs. Rasmussen and Co., of Odense, Denmark, and placed on sale at the show-rooms of the Davis Gas-Stove Company, at No. 60, Oxford Street, W. Some indication of the internal arrangements may now be given.



A. Fire-Place. B. Filling Door. C. Primary Air. D. Secondary Air. E. Combustion Chamber. F. Flue. G. Radiator Gills. H. Rocking Grid. J. Ash-Tray. K. Ash-Tray Door. L. Fresh Air Inlet. M. Hot-Air Outlet. N. Air-Heating Chamber. O. Cleaning Cover.

Section of Type "B" Danish Coke-Burning Stove.





A. Fire-Place. B. Primary Air. C. Secondary Air. D. Combustion Chambers. F. Filling Door. G. Rocking Grate. H. Ash-Tray. J. Ash-Tray Door. K. Damper Valve. L. Flue.

Section of Type "C" Danish Coke-Burning Stove.

HYDROCYANIC ACID IN COAL AND COKE-OVEN GAS.

The Minot Extraction Process.

In the current issue of "Chimie et Industrie" [August, 1921 pp. 135-140] appears a paper by M. Minot describing his process for removing hydrocyanic acid and also carbon bisulphide from coal or coke-oven gas. The paper supplements the particulars given in the French patent specification (No. 516,652) in which protection has been claimed for the process.*

M. Minot put the hydrocyanic acid in gas from Koppers coke-ovens at 1 gm. per cb.m., and lays stress on its corrosive action on gasholder plates and meter parts, and particularly on its interference with the treatment of gas in purifier boxes. In these latter there is formed, in conjunction with sulphide of iron and ammonia, a double ferrocyanide of iron and ammonia, which envelops the particles of oxide—lowering the absorptive power of the latter for hydrogen sulphide. On this account, the further use of oxide which has taken-up 50 p.ct. of sulphur ceases to compensate for the cost of labour. Removal of hydrocyanic acid is, therefore, of advantage as facilitating auto-revivification of the oxide, as well as for the value of the ferrocyanide products.

In the coke-oven gas obtained from some coals of Northern France, the content of carbon bisulphide is 0·3 gm. per cb.m., of which 0·06 gm. remains in the gas after oil-washing for benzole extraction. In the distillation of the oil, an appreciable loss of benzene takes place through the escape of the absorbed bisulphide. Hence the removal of bisulphide in this way involves a loss of both benzole and sodium ferrocyanide which otherwise should be obtained from the bisulphide and hydrocyanic acid.

The best process for the extraction of hydrocyanic acid appears to be that based on the analysis of the ammoniacal liquors, which contain ammonium ferrocyanide, from the action of hydrocyanic acid on sulphide of iron (formed by the exposure of the iron of the condensers to hydrogen sulphide) in the presence of ammonia:

$$2FeS + 6HCN + 2NH_3 = FeCN_6(NH_4)_2Fe + 2H_2S$$

and by the action of ammonia in the gas on this double ferrocyanide,

$$Fe\,CN_6(NH_4)_2\,Fe + 2NH_4\,OH = Fe\,CN_6(NH_4)_4 + Fe\,O + H_2O$$

The small quantity of hydrocyanic acid is thus extracted by removing a certain quantity of the material in the recovery vessels.

Ammonium sulphocyanide is also formed in the ammoniacal liquors by the action of hydrocyanic acid on ammonium sulphide in presence of oxygen. Part of the ammonium sulphide is oxidized to hyposulphite, but another part is converted into bisulphide:

$$H_2S + O = H_2O + S$$
$$(NH_4)_2S + S = (NH_4)_2S_2.$$

This bisulphide is the active agent in the fixation of hydrocyanic acid according to the equation,

$$(NH_4)_2S_2 + HCN + NH_3 = NH_4CNS + (NH_4)_2S.$$

This ammonium sulphide again becomes oxidized to bisulphide, which gives rise to a further fixation of hydrocyanic acid. In consequence of these reactions, ammoniacal liquors are found to contain more sulphocyanide after several days than at the time of their formation. The hydrocyanic acid dissolved in them is slowly converted into sulphocyanide. The changes are thus seen to constitute a recovery process for hydrocyanic acid, independent of an added reagent; and it is on this fact that M. Minot's system is based.

After cooling and the separation of the tar, the gas is treated before sulphating with an 8 p.ct. solution of sodium sulphide converted into polysulphide. This solution absorbs ammonia like plain water; the sulphur of the polysulphide forming ammonium sulphocyanide according to the equation:

$$HCN + NH_3 + S = NH_4CNS \quad . \quad . \quad . \quad . \quad . \quad . \quad (1)$$

At the same time, the carbon bisulphide acts on the ammonium sulphide, forming a sulpho-carbonate:

$$(NH_4)_2S + CS_2 = (NH_4)_2CS_3.$$

Two secondary reactions take place. The first is that of carbon dioxide in the gas in the sodium polysulphide solution:

$$Na_2S_5 + CO_2 + H_2O \rightleftharpoons Na_2CO_3 + H_2S + S_5$$

which tends to produce a deposit of sulphur. The second is due to the action of oxygen contained in the gas:

$$2Na_2S_5 + 3O_2 = 2Na_2S_2O_8 + S_2$$

also tending to the separation of sulphur.

An important feature of the recovery process is that an equilibrium is produced between the action of the carbon dioxide on the sodium sulphohydrate and that of the hydrogen sulphide on the carbonate of soda. The content of carbon dioxide in the gas being about eight times that of hydrogen sulphide, the prevailing reaction is that in the direction of the arrow [1]. But this reaction goes on at practically the same rate as that of the fixation of hydrocyanic acid by the polysulphide. The final result is, therefore, as though the sulphur of the polysulphide was converted directly into sulphocyanide.

The liquor gradually loses its original brownish yellow colour, and finally becomes colourless. At this stage, the liquor consists of ammonium sulphocyanide, soda carbonate, ammonium carbonate and sulphide, and a little ammonium hyposulphite. The contents of the washer are then distilled, the carbonate and sulphide of ammonium pass off, and are sulphated; while the ammonium sulpho carbonate yields sulphocyanide by decomposition: $(NH_4)_2CS_3 = NH_4CNS + 2H_2S$. The carbonate of soda decomposes the ammonium sulphocyanide and hyposulphite, producing the corresponding sodium salts.

It is evidently of importance to form the washing liquor so as to have a sodium polysulphide corresponding with Na_2S_5, since two molecules of ammonium sulphocyanide are formed for every molecule of soda carbonate—that is to say, the two salts will be in molecular proportion; and after distillation, two molecules of sodium sulphocyanide remain, contaminated with about 5 p.ct. of hyposulphite. A higher content of sulphur than Na_2S_5 may be employed in the wash liquor. In this case, after distilling off the volatile salts, an analysis is made in order to ascertain the quantity of soda carbonate to be added to displace the whole of the combined ammonia.

The sulphocyanide solution is evaporated to dryness; the salt dried, and powdered and mixed with cast-iron filings according to the well-known process. But, as a means of avoiding loss by oxidation of the cyanide during desulphurizing, the mixture of sulphocyanide and iron is placed in a tube electrically heated to 450° C., closed at one end by a plug, and having a hydraulic seal at the other. The resulting ferrocyanide is readily converted into the potassium salt.

On the industrial scale, the sodium sulphide, which represents the chief part of the cost of the recovery, is advisedly manufactured at the works. M. Minot hopes to describe at length a new process for this purpose, employing spent oxide as the source of sulphur.

In the preparation of the polysulphide wash-liquor, 80 gms. of sodium sulphide, Na_2S, are dissolved per litre of water; and this solution is employed at 60° C. for the extraction of sulphur from spent oxide. The quantity of sulphur in this latter is estimated in order to obtain the sulphide, Na_2S_5. The polysulphide solution is separated from the mass of spent oxide, and the latter is washed in a filter. The first wash-water is added to the polysulphide solution, so as to bring the latter to about 8 p.ct. Na_2S.

The solution is tested with **N** hydrochloric acid, using helianthine as indicator, for the purpose of ascertaining its content of Na_2S. With a little practice, it is easy to choose the quantities of water, oxide, and soda sulphide to yield an Na_2S_5 solution equivalent to 8 p.ct. of Na_2S. There is no objection to the solution being stronger in sulphur. In this case, there is an excess of ammonium sulphocyanide which is decomposed with the equivalent quantity of soda carbonate.

The gas is most conveniently washed in a "Standard" washer of three divisions. The wash liquor cannot be supplied continuously, because all the polysulphide must be decomposed. The washer has its place immediately after the Pelouze and Audouin plant or (if tar is extracted from the hot gas) after the condensers. It is necessary that the gas contains all its ammonia, since this takes part in the reaction (1) above, by which the hydrocyanic acid is extracted. Also the gas must be cold (21° to 23° C.) in order that the polysulphide solution shall absorb a maximum quantity of ammonia.

As soon as the liquor in the first division is exhausted—as shown by the fact that addition of hydrochloric acid does not throw-down sulphur—it is passed to the boiler, provided with a steam-coil and supplied with live steam towards the end of the distillation, for the elimination of the last traces of ammonia. Before admitting live steam, an estimation is made of the combined ammonia in the liquor, and if any remains soda carbonate is added in quantity to liberate it. The ammonia passes into a tubular condenser, and thence into the gas at the inlet to the saturator.

After the complete removal of the ammonia, the contents of the boiler are cooled in a chamber fitted with a cold-water coil in order to harden any tar collected in the cyanide washer. The liquor is then passed through a filter-press and is ready for concentration. A Kestner apparatus can be used for this purpose, or that of Prache and Bouillon, and the sulphocyanide liquor concentrated to 50° Bé. It is then evaporated to dryness.

The following are M. Minot's figures for the cost of producing 100 kilos. of sodium ferrocyanide.

Expenditure.

	Frs.
Spent oxide, 60 p.ct. S, 80 kilos. at 60 frs. per tonne	4·80
Soda sulphide, 65 p.ct., 90 kilos. at 120 frs. per 100 kilos.	108·0
Cast-iron filings, 85 kilos. at 30 frs. per 100 kilos.	29·0
Fuel	40·0
Power and electric current	50·0
Labour	8·0
	239·80
Overhead charges, 10 p.ct.	23·98
Total	263·78

Receipts.

100 kilos. of sodium ferrocyanide at 5 frs. per kilo.	500·0
32 kilos. of extracted oxide at 60 frs. per tonne	1·9
Total	501·9

For conversion, the crude dry sulphocyanide is placed in a

* This subject was referred to on p. 589 of last week's "JOURNAL."

malaxator with the calculated weight of cast iron in small grains *plus* a further 5 p.ct. After a few minutes' malaxation, the mass is charged into tubes of refractory ware and heated by a nickel-chrome resistance to 45° C. for two hours. Very little current is consumed. The resulting sodium ferrocyanide is extracted with boiling water; the solution filtered; and the salt crystallized.

SOCIÉTÉ TECHNIQUE DU GAZ EN FRANCE.

Industrial Uses of Gas—Benzole Production.

IN his presidential address to the Société Technique at Tours on June 14, M. Edouard Kaeuffer briefly sketched the part played by gas during the war. "Whoever uses gas," he quoted from a war-time German pamphlet, "reinforces our armies in the field and strengthens our economic power." No industry had greater troubles to contend with than the gas industry. Coal was scarce and rationed; and its soaring cost found no counterpart in the statutory price of gas. But the industry carried on in spite of its difficulties; and M. Kaeuffer showed by a chart how France, with her shipping threatened and her main coalfields in hostile occupation, steadily increased her consumption of gas. Especially was this the case with industrial gas, as the following comparative table will show.

Table Showing the Increase in the Use of Industrial Gas, 1913-20.

Industries.	1913. Cubic Metres.	1920. Cubic Metres.	Increase. Per Cent.
Glass-works	107,739	383,152	255
Dye-works	622,977	701,643	12
Chemical works	170,341	640,964	276
Biscuit works	100,176	132,728	32
Bakeries	42,016	54,980	31
Engineering shops	191,132	578,904	203
Motor works	266,842	627,921	135
Wiredrawing	132,580	286,415	116
Arsenals	12,921	13,756	6

The President dealt at some length with the extraction of benzole as developed during the war for munition purposes. Before the war, scrubbing for benzole was confined chiefly to the coke-oven works, whose annual production did not exceed 16,000 to 18,000 tonnes [1 tonne = 0·9842 ton (British) = 1000 kg.]; the country being beholden to Germany and England for her further requirements. After the enemy occupation of the North and its rich coalfields, the daily production of benzole fell to 3 or 4 tonnes, whereas the demand reached 50 tonnes a day in 1915 and increased later to 250 tonnes. The Government were forced to take emergency measures, among which were the construction of many coke-oven batteries, and compulsory (though by statute without profit) debenzolization by gas-works throughout the country—the output being supplemented by British and American exports. In co-operation with the Munitions Department, the chief Gas Associations hastened to instal the necessary scrubbing plant; and as a result of their efforts, the total production of benzole soon reached 35 to 40 tonnes a day—about 15 p.ct. of the Department's needs. In the case of the President's Company (Gaz de Lyon), benzole 90's, heavy benzole, and solvent naphtha were handed-over without further refinement. The scrubbing plant was put to work in May, 1916, and continued to function till January, 1919. The results are shown by the figures below.

Output in Kg. per Tonne of Coal Distilled.

—	Benzole, 90 P.Ct.	Solvent Naphtha.	Naphthalene.	Total.
1916	7·23	1·11	0·50	8·84
1917	8·12	0·76	0·25	9·13
1918-19	7·78	0·64	0·20	8·62
1916-19	7·80	0·79	0·28	8·87

M. Kaeuffer then gave a description, accompanied by a diagram and a curve, of an apparatus (devised in the Perrache works laboratory) for the rapid determination of the vapour tension of benzole in washing oil.

The war work of the Compagnie du Gaz de Lyon by no means ended with its manufacturing achievements. From the early days of 1914, attention was given to the needs of their mobilized men and their dependants. A Benevolent Fund was formed, and divided later into two funds—one for outside employees, the other for their "*ouvriers*" within. These funds were administered with care and great enthusiasm by Joint Committees of the staff and workmen. Relief in kind and in money was provided for the families of the "*poilus*;" assistance was forthcoming for those bereaved; baby linen was provided for maternity cases, and clothes for the children; parcels and money were sent to the front; and any man decorated with a Croix de Guerre received a recognition of 100 francs. The expenditure in gratuities to the home-coming amounted to 168,450 francs. Finally, an Orphanage was founded for children whose fathers gave their lives to France. To-day there are nineteen boys and nine girls in it.

The President, whose address throughout was received with great enthusiasm, closed by paying homage to the memory of Philippe Lebon, whom he claimed as "the inventor of illuminating gas," who died (assassinated in the Champs Elysées) in 1804.

BRITISH ASSOCIATION FUEL ECONOMY COMMITTEE.

At the recent meeting in Edinburgh of the British Association (Section B) the fourth report was presented of the Committee appointed for the "Investigation of Fuel Economy, the Utilization of Coal, and Smoke Prevention." Professor W. A. Bone is Chairman of the Committee; Mr. H. James Yates, Vice-Chairman; Mr. Robert Mond, Secretary; and of the twenty-two other members twelve are members of the Executive Committee.

The report states: Owing to two unforeseen causes—namely (1) the unprecedentedly difficult and anxious industrial situation during the past autumn and winter, accentuated as it was by the stoppage of the coal mines in October last, and culminating in the great coal strike of this year, and (2) the sudden and serious illness of the Chairman in February last (now, however, safely passed through), necessitating his relinquishing all his professional work and public duties for three months, the Committee has not been able to fulfil the programme of work which it proposed a year ago. Accordingly, it cannot present this year anything in the nature of an extended report, but must confine itself to a brief general statement as to the present fuel situation, and to the importance of its future work and plans in relation thereto.

BOARD OF TRADE GAS COMMITTEES.

Since the Committee was last reappointed, the Board of Trade, under powers conferred upon it by the Gas Regulation Act, 1920, set up two *ad hoc* Special Committees to deal with the important question of whether or not it is necessary or desirable to impose any limitation as to the amount of (*a*) carbon monoxide, and (*b*) incombustible constituents ("inerts") permissible in public gas supplies. As the Committee had, in its second and third reports, already expressed the view that such limitations are desirable, it appointed a Sub-Committee to arrange for its views being formally represented to the Board of Trade Committee. Upon the question of carbon monoxide, the Sub-Committee had the advantage of conferring with Dr. J. S. Haldane, who expressed himself entirely in agreement with the Committee's views that the CO content of a public domestic gas supply ought not to be allowed to exceed 20 p.ct. Dr. Haldane himself gave evidence to this effect on Feb. 10 last before the Board of Trade CO Committee; and subsequently Mr. Robert Mond presented to it the considered views of this Committee upon the subject, in accordance with its previous reports. Owing, however, to the Chairman's illness, no formal representation was made about the Committee's views as to the question of the limitation of "inerts," although the Board of Trade was aware that they were in agreement with the recommendations made in 1918 by the Fuel Research Board.*

[* Three members of the Committee—Messrs. E. V. Evans, D. H. Helps, and H. James Yates—were, however, of the opinion that, in view of the provisions of the Gas Regulation Act, 1920, for the future sale of gas on a thermal basis, gas undertakings should be allowed a free hand in regard to carbon monoxide and inerts.]

THE COAL SITUATION.

In its previous reports, and particularly in the one presented at Bournemouth in 1919, the Committee has repeatedly warned the country of the serious economic dangers attendant upon the rapidly increasing cost of producing coal in British mines. Last year it published official statistics showing how rapidly our coal export trade was declining.

Some important statistics upon these points were given in a paper upon "The Economics of the South Wales Coalfield," which Mr. Hugh Bramwell read at the joint meeting of this Committee with that of the South Wales Institute of Engineers at Cardiff on Aug. 26, 1920. Among them were the following which, referring to a group of South Wales collieries, "illustrate in detail the relation between the production per person employed per pit working day and the earnings per person employed, also per pit working day, for the past six years, plotted weekly, and averaged each six months."

Period.	Duration.	Earnings per Person Employed per Pit Day.	Production per Person Employed per Pit Day.
		s. d.	Tons.
1	No. 1 Pay 1915 to No. 22 Pay 1916. Prior to 15 p.ct. advance	7 1·30	0·768
2	No. 23 Pay 1916 to No. 37 Pay 1917. Period of 15 p.ct. advance	8 11·40	0·758
3	No. 38 Pay 1917 to No. 26 Pay 1918. First war wage addition	10 8·79	0·742
4	No. 27 Pay 1918 to No. 1 Pay 1919. Second war wage addition	11 11·03	0·718
5	No. 2 Pay 1919 to No. 29 Pay 1919. Sankey wage addition	13 7·84	0·677
6	No. 30 Pay 1919 to No. 17 Pay 1920. Hours reduced 8 to 7 and piece-work rates increased by 14·2 p.ct.	14 3·15	0·561
7	No. 18 Pay 1920. Additional 20 p.ct. on earnings	—	—

On March 11 last the Secretary for Mines officially reported

the following comparative statistics concerning our British coal industry in the years 1913 and 1920, respectively:

Average Cost of Producing a Ton of Coal in Great Britain.

	1913.	1920.
Wages	6s. 4d.	25s. 9½d.
Timber, stores, and other costs	1 10	7 8
Royalties	0 5½	0 7¾
Total cost	8 7½	34 1¼
Add owners' profits	1 6	2 6½
	Tons.	Tons.
Total coal raised at mines	287,412,000	229,295,000
Total coal raised per person employed at mines	229	190
Amount of coal shipped abroad:		
As cargoes	73,400,118	24,931,853
As bunkers	21,031,550	13,840,360
Total	94,431,668	38,772,213

The position thus revealed may be summed up as follows: (*a*) The average cost of producing coal at the pithead had in seven years increased nearly fourfold, while (*b*) the amount raised per person employed had diminished by more than 25 p.ct., and (*c*) our coal exports to foreign markets (excluding bunkers) had fallen to one-third the pre-war amount.

The rapidly increasing costs of producing coal in Great Britain have already reacted most detrimentally upon its finances and trading position. For some time prior to the recent strike, the cost of producing coal at the pithead had exceeded its selling price by several shillings per ton. The difference had been made up by a subsidy from the public funds, at the expense of the taxpayer. The crisis was precipitated by the decision of the Government that, after March 31 last, this subsidy must cease, and that the coal industry must revert to its former position of being self-supporting.* The strike came as a final blow to the country's industries, already crippled by intolerably high coal prices. The coal-export trade, which for some time had been rapidly declining, was brought to a standstill, with disastrous effect upon the shipping trade. It must also be remembered that coal is the principal mineral which this country has to export, and that in the past our coal exports have not only given British ships outward cargoes and freights, but have materially helped to pay for the large amounts of raw materials and foodstuffs which must be imported to maintain our factories and workers. The recent marked contraction in British coal exports, which in pre-war days easily dominated the overseas markets to our great advantage as a maritime power, has coincided with a great expansion in American coal exports, which now seriously threatens our once unrivalled position.†

While the Committee has steadily refrained from intervening in what may be regarded as the political aspects of the coal question, and therefore expresses no opinion as to the various *ex parte* proposals which have been put forward for the future organization of the coal trade, it is nevertheless well within its province to urge the necessity, from the point of view of national economy and well-being, of a substantial reduction in the cost of producing coal in this country.

In this connection the Committee would draw attention to the weighty declarations made in May last by Sir Hugh Bell (as President of the Cleveland Mineowners' Association) and Mr. Alfred Hutchinson (one of the members of the Committee and President of the Cleveland Ironmasters' Association) to the effect that, even were the differences in the coal trade to be settled immediately, there could be no resumption of work in the iron and steel industry on the old scale without a very drastic reduction in coal prices. Wages, they said, are governed by a sliding-scale; but even when wages have been reduced to bed-rock, Cleveland pig iron cannot be manufactured, excluding all question of profit, at the price at which foreign pig iron is being delivered into this country, unless coke of good quality can be delivered to the furnaces at about 27s. per ton. Mr. Maurice Deacon has recently pointed out that an even lower figure than this would be required if the iron trade of the Midlands is to continue in being. Without necessarily accepting any particular figure, the Committee would again emphasize the view, which it already expressed in its second report—namely, the absolute dependence of the country's industrial system upon its ability to produce relatively cheap coal, which is, indeed, the keystone of its whole economic structure.

Oil Fuel.

During the recent coal strike, successful attempts have been made in several directions in this country to substitute oil fuel for coal. Oil has thus been used with good results in public electric power stations, for driving steam locomotives on the railways, and also in the case of several large ocean liners. So many advantages are claimed for oil as against coal firing, in regard to cleanliness, labour saving, and general efficiency, that the question of how far such substitution can be economically kept up or extended in future will depend largely upon the prospects of ensuring regular and adequate supplies of fuel oil at reasonable prices that can be established. It would undoubtedly be advantageous to the country if its power stations, railways, and other such public services could be rendered less dependent upon coal than they have hitherto been. Such a consideration makes it more than ever important that our future sources of supply of liquid fuel should be thoroughly explored; and therefore the Committee proposes in the immediate future to include such an inquiry in its programme of work.

Federation of British Industries Fuel Economy Committee.

The Committee has learned with much satisfaction of the establishment by the Federation of British Industries of a special Committee (of which Sir Robert Hadfield, Mr. H. James Yates, and Prof. Bone are members) to assist manufacturers in economizing coal in their operations, and of the good and effective work that it has already accomplished in this direction. The Committee hopes, through the said three members (who are common to both), to keep in touch with and help forward the work of this new Committee.

Future Work.

In view of the serious position of the coal mining and consuming industries, of the increasing attention that is being given to the possible substitution of other fuels for coal, and therefore of the consequent continued need of a body of disinterested scientific experience and opinion that can be brought to bear upon the various aspects of the fuel question, the Committee asks for re-appointment for another year, for the purpose of completing the investigations outlined in its third report a year ago, with a grant of £35. The patronage and help of the Committee has also been requested in connection with the proposed Smoke Abatement Exhibition to be held in London, in March and April, 1922, under the auspices of the Coal Smoke Abatement Society.

APPENDIX.

Some Comparative Statistics for British and American Coal Exports for the Years 1913 and 1920 respectively.

In amplification of what has been said in the main report about the threatened loss of our once dominant coal-export trade, the following comparative statistics (recently published in "Imperial Commerce and Affairs") may be quoted:

(1) In the year 1913 the United States exported altogether 20,708,582 tons of anthracite and bituminous coals, of which, however, only about 5 million tons went overseas. Some 14,482,929 tons of bituminous coals went overland into Canada. In the same year Great Britain exported to other countries no less than 73,400,118 tons of coal (excluding ships' bunkers). Thus it would appear that in 1913 Great Britain sent overseas about 15 tons of coal to every ton sent overseas from the United States.

(2) In the year 1920 the British coal exports (excluding bunkers) had declined to 24,931,853 tons, while those of the United States had increased to 39,215,030 tons, of which nearly 25 million tons went overseas. In other words, while our overseas coal trade had shrunk to about one-third of its pre-war dimensions, that of the United States had increased fivefold.

(3) The United States has already made great inroads into the European coal markets, selling 10,240,422 tons of bituminous coals (besides some anthracite) there in 1920. She has also almost captured the Central and South American coal markets, where we were once supreme; for while our coal exports to Central and South America had fallen from upwards of 17 million tons in 1913 to rather less than 3·7 million tons in 1920, those of the United States had increased something like tenfold.

WILLIAM A. BONE.

London, June 30, 1921.

Precautions with Pulverized Coal.—As the result of investigations, the United States Bureau of Mines offer the following suggestions in connection with the use of pulverized coal: A small stream of pulverized coal leaking down from a defective joint in a coal transport line does not attract much attention. As a matter of fact, if by any means the dust cloud should come in contact with an open flame or hot metal, the effects would be disastrous. One of the most serious troubles with which users of pulverized coal have had to contend has been the number of fires in the storage bins. It has been somewhat difficult to determine the exact cause of these fires; but undoubtedly spontaneous combustion has played an important part in the origin of some of them. Care should be taken that pulverized coal at a high temperature is not delivered in storage bins; and to avoid this, the gases of combustion from the drying furnace should not be allowed to become hot enough to overheat the coal. Storage bins for pulverized coal should not be placed in any position where they may become heated from furnaces, steam-pipes, or hot flues. If plant has been shut-down for several days, delivery of coal from the storage bin through transport lines to the place of consumption should not be permitted before an examination is made to ascertain whether the coal has become heated to a point that it will ignite when brought in contact with a current or blast of air.

* When, however, the strike was finally settled on June 28 last, the Government agreed (subject to the consent of Parliament, which was afterwards given) to grant a sum not exceeding £10,000,000 in subvention of miners' wages.

† *Vide* the appendix to this report.

NORTH BRITISH ASSOCIATION OF GAS MANAGERS.

The Annual Meeting in Perth.

WE complete to-day our report—see *ante*, pp. 596-600—of the recent meeting of the North British Association of Gas Managers, by giving the paper read by Mr. John W. M'Lusky, of Glasgow, and the lengthy discussion to which it gave rise.

CONSUMERS' COMMONEST COMPLAINT.

By JOHN W. M'LUSKY, of Glasgow.

There are two big objectives in the business life of the gas manager. The first is economical production of gas for his community; the other, satisfactory service to the consumer.

So much has recently been written and spoken on the first that I propose to deal with the second to-day. When addressing the Eastern Junior Gas Association in Edinburgh some weeks ago, I touched briefly on the question of adequate supply; and I am so convinced of its importance that I hope to stir your minds to-day into stated opinions, so that we may let our consumers see that they are in our thoughts, and that we are deeply concerned for the solution of problems directly affecting their interests.

The aftermath of war found many gas undertakings seriously handicapped in every direction, for reasons too well known to be reiterated here. Had the period 1914-19 been one of peace, with the usual commercial enterprise and competition, there is no doubt the tremendous amount of work in contemplation would have been long since an accomplished fact. However, despite the abnormally high prices still prevailing, responsible officials must no longer use the war period as an excuse for inadequate supplies. Whether the money is to be spent in manufacturing plant or in mains and services, the issue is clear-cut and imperative. Let it be village, provincial town, or city—we must get rid of the "Consumers' Commonest Complaint." We all know it—its abbreviation is "bad gas;" and "bad gas" is a consumer's nickname for "shortage." We have all read letters from consumers telling us the exact time on the clock when the gas becomes "good;" and we know the statement usually synchronizes with the time a change takes place in the volume of gas available in the consumer's particular locality. A satisfactory increase in volume to meet every possible demand will make a speedy end of such correspondence. Probably if a written consensus of opinion were taken from this audience to-day, the result would be an emphatic decision that the calorific value will be gradually decreased in ratio to the time required to increase the carrying capacity of mains and services. The Scot is nothing if he is not cautious. As a gas manager, he makes haste with a prudent degree of philosophic slowness; and in this question of quality and volume, he will ever keep in mind that the consumer seldom or never grumbles if the supply of gas is arriving in sufficient volume at the point of ignition. To ensure this then we must have an ample and well-equipped distribution department.

Presuming, for the sake of concentration, that there is ample manufacturing plant to meet the maximum demand, our attention next hinges on trunk mains, feeder mains to weak districts, subsidiary mains, and services. It is up to each responsible official to review his entire distribution system on lines suited to his calorific value policy. In Glasgow we are busy installing high-pressure mains to carry large volumes of gas direct to districts where complaints of shortage have been rampant; and, by assiduous attention, we hope to stamp-out entirely this very common complaint. But our troubles are not at an end when we spend vast sums on machinery, high-pressure mains, and services. What are we going to do as an Association with the private main and service, the tenement service, and the internal pipe system, which are all undersized? And what are we going to do about the incandescent business? We hire-out gas appliances, and we maintain them more or less; but what do we say to the consumer who expects an adequate supply of gas for the gas-fire, when there are already installed in the house a circulator and a cooker, and the inlet pipe is ⅜ in. bore? And probably this is one of several in one tenement. We are unanimous about what we are going to do in the new housing schemes; but that is all in the dim and distant future. The question to-day is what are we going to do as an Association to evolve some definite scheme to increase existing internal pipes in old properties?

The majority of property owners hand over the conduct of their property to house factors. It is to the latter's interest to run the business on as low a percentage expenditure against income as possible; otherwise the owner may hand over the business to a rival firm. With the shortage of houses existing, a landlord is in the position of a dictator, so long as he keeps within the requirements of the Public Health Acts. Sentiment does not have any part whatever in the relations between landlord and tenant; and, consequently, a tenant gets the minimum of consideration for his comfort.

The service pipes supplying a great number of houses and tenements date back to the period when (1) higher calorific value was supplied; (2) lighting was the only load to be carried; (3) internal corrosion was practically *nil*.

Landlords are aware that gas authorities are anxious to obtain all the consumption possible, and will not inconvenience themselves by doing something which they conceive to be entirely for the tenants' convenience (which they frequently ignore) or for the purpose of swelling a department's revenue. If we (as individuals) were in the position now occupied by house factors, probably we should take up the same attitude—*i.e.*: "It will not increase the rent received, and it will entail an expenditure equivalent possibly to a year's rent to renew the gas-fittings from the building line to the appliances or meter inlet. Therefore we will not voluntarily act, as we lose nothing by being obstinate."

The following remedy, although somewhat drastic, has proved highly successful in Glasgow—viz., to write informing the landlord or agent, "that the pipes supplying certain premises are in a dilapidated and dangerous condition, and this fact having come to our knowledge, we cannot undertake knowingly to allow the risk of life; hence we intend to disconnect at the main at once." The onus is then definitely on the agent; and in two cases recently it acted like magic. This refers to very old property.

We must, however, take a long view of this question. House agents are invaluable allies in sales organization and development. They have first-hand news and particulars of changes of tenancy, including the full addresses of both parties; and if we force their hand in the matter of service renewals, they will refuse to work with us in getting new business.

One important fact must not be lost sight of—many of the comparatively old properties in Glasgow and elsewhere are still in excellent condition, and the tenants pay high rents. These properties are heavily timbered and plastered, having been built possibly before the word "jerry" was understood. To remove existing gas-pipes from them and replace with larger would entail a very considerable sum of money per tenement. Who is to bear this expense—the owner, the gas consumer, or both?

The relationship existing between the gas manager and the property owner or his agent is one that is frequently wrapped round with too much red tape. Certainly we have by-laws and precedents and such terms as "use and wont;" but they are in great need of modernizing. I suggest that a committee of the Scottish gas industry—consisting of (say) the Council of the Association with six other representatives—should carefully consider the matter; and it might be decided later to include town clerks and gas conveners and representative chairmen of a few gas companies. This committee would draw-up a definite policy of procedure, subject to the approval of the Association, which would in turn be submitted to a representative body of property owners or their agents. Until this or something similar is successfully carried out we shall continue to mark time as an industry in so far as most of the older properties are concerned. The policy of "marking time" is fatal to up-to-date electrical opposition.

Now, as to private appliances and incandescent fittings. I have referred to the necessity for an adequate supply of gas where and when necessary; and we all admit that if we hire-out appliances, we should see that they are maintained in efficient condition, and used wisely and economically. But what about private appliances or incandescent fittings (good, bad, or indifferent), purchased from the highest-class store or the broker's barrow? Enormous quantities of gas are wasted through the use of inferior appliances and fittings; and the gas department gets the blame and the adverse criticism. Here is another problem for the special committee to tackle, backed-up by the industry. At the very outset, we shall find ourselves up-against our friends, the master plumbers. Like all other tradesmen, the object of master plumbers is reasonable profit. They have not trained or equipped their staffs to do maintenance work; but they fear that if they surrender their supposed right to this class of work, it will result in the ultimate loss of all classes of gas-fitting work in the district.

To be of any use, a maintenance scheme must include all gas appliances, and not simply the lighting burners. It should be systematic and regular, or its value is lost. To await a special request, is often to await the change-over from gas to electricity. Master plumbers could not afford to create such a staff as would be required for supervision, collection of accounts, &c., on the chance of inducing customers to "go on maintenance." If they did so, the cost to customer would be prohibitive. The scheme must be a voluntary act on the part of the gas undertaking. If it depends upon a customer's request, or even good canvassing, the result is patchwork, and much more costly per appliance than one which embraces all the customers in a street.

This provides a splendid opportunity for finding new business—the staff having a knowledge of all existing appliances on the premises. They would also be instrumental in reducing to a minimum the number of idle or semi-idle appliances on the district. If the master plumber cannot do this work, what can be given him not merely to allay his opposition to a maintenance scheme, but to secure him as an ally? Reasonable profit on fitting work! No matter whether the work comes to his office direct or is farmed-out to him by the gas department, we should pay him at schedule rate for the job, subject to our inspection on completion. Then the more work we find, the better he will be

pleased; and what is perhaps most important, no "shoddy" job will be done on our district without our knowledge.

To be completely successful, such a scheme should be independent of our customers' sanction, and should be common to all. Under such conditions, obviously the cost must be included in the gas charge—thus saving the very costly "charges staff" if any direct payment or "C.O.D." is introduced.

Let us seriously consider the quickest and most efficient method of exterminating the "Consumers' Commonest Complaint."

DISCUSSION.

Mr. JOHN BALLANTYNE (Hamilton), in opening the discussion, said he personally had listened with delight to the paper, which was one bristling with points of interest to every gas manager. Many of them, however, fully realized and appreciated the difficulties that arose; and he felt there was some justification for the call Mr. M'Lusky had made for the appointment of a Committee to go thoroughly into the whole question and the issues involved. He knew that there were many communities like his own in Hamilton, which were right up-against legal difficulties; and it might not be a bad thing if the Committee that Mr. M'Lusky had suggested—comprising both managers and gas conveners or directors—could confer together and endeavour to arrange for the promoting of some kind of legislation which would cover the points involved. Of course, it was quite recognized that many of the smaller companies which were not working under Provisional Orders or Acts of Parliament would do largely what they liked; but these districts (and Hamilton was one), which were carrying on the gas undertaking under legislative control, could not do so. Speaking for himself, he was so bound-down by legislative enactments that he could only lay a pipe or enlarge a pipe to the line of the street. He was not allowed to go an inch beyond. Furthermore, he was severely restricted in regard to repair work; and he was prohibited from entering a house and doing any alterations that might be necessary. These were very apparent and obvious difficulties—difficulties he was bound to admit which could not be overcome until they had legislative authority for doing so. To his mind, it would be a capital idea if a Committee were formed and arrangements made for going forward unitedly with a scheme of legislation which would give them more control inside the houses where the difficulties touched upon in the paper arose. There were many dwelling houses where the landlords or their factors declined to put things right. Where circumstances of this nature prevailed, then the local gas authority ought to have power to step-in and put things right either in one way or another. On the attitude of the master plumbers, his own personal experience was that the master plumbers were quite prepared to step-in and take over a particular enterprise after the Gas Department of the Hamilton Town Council had been at the pains to work it up. About eighteen years ago, they tried in Hamilton to organize a scheme for dealing with incandescent burners. The Gas Committee took it upon itself to send out invitations to the local master plumbers and the ironmongers in the town with a view to a full, free, and frank discussion of the whole subject. But hardly one of the master plumbers or the ironmongers could be prevailed upon to attend the meeting. The Gas Committee had arranged a scheme which they proposed putting before the meeting, whereby neither plumbers nor ironmongers incurred the slightest risk of losing a single penny in connection with it. On account of the apathy, or want of enthusiasm, of the class of individuals he had named, the whole scheme fell through. At a later period in Hamilton's gas history, the Gas Corporation developed the idea of hiring-out gas-fires on the hire-purchase system. As soon as the Corporation established a good connection and a developing business, the master plumbers stepped-in and requested that they should be given the work of installing the gas-fires. The mischief of the whole thing was that the master plumbers came forward and claimed the privilege of being allowed to do work after the Gas Department had made the business, or shown that it could be made. The master plumbers themselves would never take the trouble to do anything at all. On the general question raised in the paper, they as gas manufacturers wanted to get some kind of legislative authority which would overcome the difficulties that had been enumerated—an authority which would give them a freer hand in dealing with many of these clamant cases of defective supply. As all of them knew, there were many cases at present where gas companies and corporations were completely tied-down, and could do nothing at all to help those who were complaining.

Mr. GEORGE BRAIDWOOD (Coatbridge) said there were one or two remarks which the author made in his paper with which he did not entirely agree. It would be noticed that one of the opinions Mr. M'Lusky ventured was: "Probably if a written consensus of opinion were taken from the audience to-day, the result would be an emphatic decision that the calorific value would be gradually decreased in ratio to the time required to increase the carrying capacity of the mains and services." This declaration had to be read in conjunction with a second one at a later stage in the paper, which ran: "It is up to each responsible official to review his early distribution system on lines suited to his calorific value policy." No doubt, Mr. Braidwood proceeded to say, this might be true where gas was being sold under the old-fashioned method on the cubic foot basis; but where gas was sold under the new method adopted by the Board of Trade—namely, the "therm"—he was not at all sure that the same thing would apply. What these concerns that were selling by the therm would aim at was to sell the largest number of B.Th.U. per ton; and this did not necessarily mean a large make of gas per ton or a low calorific value. The point they would try to aim at was to make their residuals reach the cost of coal as nearly as possible; and they would fix their declared value to suit the residuals market. This he considered was a tremendous advantage which was obtained under the new method of charging. Of course, there was always one obligation to be met when the declared value was altered—namely, to make the consumer's apparatus suitable for the burning of the different qualities of gas declared. There seemed no question of this, as Mr. Dickson, the President, had suggested, that vertical retorts did place undertakings in the splendid position of being able to work their plant to suit the varying conditions of the residuals market. As Mr. M'Lusky himself pointed out in the paper, the Scottish gas manager was inclined to "hasten slowly." On this subject, then, he (Mr. Braidwood) was strongly of the opinion that the question of high or low calorific value was still an open one, and conclusions ought not to be jumped-at or hastily reached, certainly not until some years of experience had been gained by working under the "therm" basis of charging. The experience which was being obtained at Coatbridge, and the early and possibly premature ideas which were being formed, suggested that a warning should be given that a low calorific value was not of necessity the best declared value. The matter entirely hinged on the residuals market. With regard to service-pipes, the author pointed out that some service-pipes dated back to a period when, among other things, corrosion was practically *nil*. This condition of things, however, was not very ancient. Indeed, a very few years ago he (Mr. Braidwood) could remember the free oxygen content of gas was practically *nil*. What was it to-day in a great many cases? This condition of affairs could and would be put right under the new Board of Trade method of charging. The use of steel service-pipes, instead of the old malleable iron tubes, was also worthy of note in this connection. Personally, he was of opinion that satisfaction would never really be obtained until the gas undertaking was responsible for the supply right up to the gas-meter. This, of course, was solely a question of money; but it would undoubtedly result in increased business, besides giving greater satisfaction to the consumer.

Mr. W. S. EASSON (Peterhead) said that the commonest and most general complaint among the public to-day was in regard not so much to the quality as to the high price of gas. The real truth of the matter was that a clamouring public demanded to-day to know the reason why the price of gas in the majority of places was so high. Many answers no doubt could be given; but he had the feeling that none of them was very conclusive. A common ground of argument was that, with coals increasing in price, it followed as a natural sequence that the price of gas would correspondingly advance. On the other hand, the argument equally held good that with coals decreasing in price, the cost of gas must also go down. The position at the moment was that the reverse of general expectation was taking place; and there could be no question about it, it was a situation which was operating with detrimental results to the gas industry. Frankly, he had been more than astonished that undertakings equipped with the latest and most modern labour and gas saving installations were increasing the price of gas to the consumer. Keeping in view the fact that so many recent advances had been made, surely something better could have been expected from such undertakings after so much had been expended in providing them with the latest of equipments. If the vertical plants—the Tully and all others—were so productive and labour-saving, why were they not seeing results? In towns where such installations had been laid down, ought not the price of gas to be very much less than it was? No doubt capital costs had a great deal to do with the situation; but consumers were suffering, and if the truth must be told they were now grumbling and becoming rather impatient. The industry, as a result, was standing to lose what he regarded as a fine asset—namely, the confidence and patronage of the consumers. Surely the industry ought to realize that, without the consumers, gas undertakings would be extinct? Cheaper gas would do much to restore and maintain confidence in the industry; and the fact that that cheaper gas was not materializing was to his mind the consumers' commonest complaint. He was willing to concede that among the consumers there was a complaint respecting bad gas. Speaking for himself, he would like to see a lucid and true definition of the term "bad" gas. Occasionally he did meet one or two of his own consumers whose complaint was that they were getting bad gas. Investigation invariably showed that the root of the trouble was the usual "small service-pipe" grumble. Once this was rectified, he usually chaffed the consumers by remarking that there was only bad gas when they lodged their complaints. At the same time, he had to admit it was quite possible to get bad gas when "modern thinkers" came along and tried to palm-off a 380 or 420 B.Th.U. gas. No wonder there was grousing and dissatisfaction. Not long ago he went into a small works not a hundred miles from Perth, and found no 5 in., 4 in., or 3 in. flame, but a 2 in. flame, about which there was no luminosity whatever. The 2 in. flame was all blue gas, and illuminating power was not visible. Was there any wonder that there were complaints from such a district? In the locality he made the discovery that the consumption of the gas for the year had increased by 15 or 20 p.ct. To him the discovery was not the least bit surprising. In the North of Scotland the cry was for good and cheap gas and plenty of it. Could it be done? He maintained that it surely could; but if it were to be accomplished, the so-called trivialities from the carbonizing to the distributing systems must be rigidly overhauled. From the point of view of the selling price of gas to-day it had been demonstrated that the old system compared fairly well with the more modern systems of carbonization. All honour, he said, to the works management that had wriggled through on a 50 to 80 p.ct. increase on the pre-war selling price of gas. He did not for a moment uphold the creed that, to manufacture gas, they had to use old and obsolete methods for the sake of utilizing labour. He did, however, desire to emphasize the fact that when they dispensed with sources of labour they of necessity ought to extend their ramifications in the avenues of new industry and revenue. Personally, he hoped that with the general decline in the inflated prices charged for all raw materials used in the industry, the day would be hastened when they would witness great reductions in the realm of gas manufacture.

Mr. GEORGE BRUCE (St. Andrews) contended that one of the chief causes of complaint among consumers was the insane desire that had set in for big makes per ton of coal. It was a far better policy for gas departments to consider the interests of their consumers by giving them a superior quality of gas. It was sound commercial business for a gas undertaking to consider, in the first instance, the interests of the consumer. Give the consumer the best of gas and the kind of gas that is going to suit his requirements. It was all very well to blame the pipes, but this was a bogey that could be over-stretched. He quite conceded that in the large towns, where the pipes were small, there were many difficulties in the way; but he had the feeling that many of the complaints arose from the low calorific value of the gas that was being manufactured. In the country districts the consumers were

getting better gas and cheaper gas than they were receiving in the cities. This was not as it should be, and it caused him to emphasize his main point—that they must not get too low down in calorific values if they were to maintain the position of the industry against electric light.

Mr. SAMUEL MILNE (Aberdeen) said it might be assumed that the gentleman who had just spoken was very much out of date; but he confessed to having a great amount of sympathy for him in his attitude. His (Mr. Milne's) own feeling was that when the standard of gas went down to 420 or 440 B.Th.U., it was not a credit to any gas department. In his opinion, it was only tending to bring the gas industry into disrepute. A former speaker—he believed it was Mr. Braidwood, of Coatbridge—twitted the writer of the paper because of this observation: "Possibly, if a written consensus of opinion were taken from the audience to-day, the result would be an emphatic decision that the calorific value will be gradually reduced in ratio to the time required to increase the carrying capacity of mains and services." He rather supposed that what the author meant to say—and he certainly gathered as much from his remarks—was that if they were going to supply gas of 400 B.Th.U., then the carrying capacity of the mains must, of necessity, be enlarged. The services and meters must also be enlarged; and, in addition, there was the worst feature of all, which they were very slow to effect—there was the question of the distribution pipes inside the buildings. In Aberdeen, circumstances enabled them to carry forward a properly-sized and ample supply-pipe right up to the meter; but, unfortunately, they did not have any control beyond. He did feel that it would be in the best interests of every gas department in the country if it was in a position to undertake the maintenance of the gas-fittings throughout the houses. He included gas-fires in this reference of his to maintenance of gas-fittings. In Aberdeen they had practical control of all gas-fires and cooking appliances. The cooking appliances, he might explain, were given out free; while, on the other hand, the gas-fires were hired at a moderate rental. So far as burners were concerned, they did not often sell them, which he thought was rather a pity. In Aberdeen they came right up-against the master plumbers when they sought to introduce gas-fires and gas-cooking appliances. Indeed, master plumbers as a body made representations to the Town Council of Aberdeen that the Gas Department of the city was seeking to take the bread out of their mouths. They went further even than this, and alleged that it cost the Gas Department in Aberdeen very much more to carry out this work than it could be done for by private enterprise. The subject was then most carefully gone into, and from the report which was drawn-up, it was demonstrated that the Gas Department in the City of Aberdeen was able to undertake the work at a remarkably low rate. In this way the contention of the master plumbers was silenced; and although this occurred a good many years ago, they had heard nothing of it since. It did seem to him that the plumbers and gas-fitters of to-day did not quite know the *a b c* of gas appliances. An instance of this ignorance came before him not long ago, which he would give as an illustration of the point he was seeking to make. In a certain restaurant in Aberdeen there was a boiling-table 5 ft. long by 2 ft. broad. The proprietor of the restaurant came to the Gas Department recently and asked "Can you do anything with this boiling-table? I have already had two plumbers pottering away at it, and their accounts are as much as £15 and £20 each. Despite this, the table is worse than it was before they started." The Gas Department had the table examined, and they found that an ingenious plumber had removed the ordinary nipples supplying the gas for the hot mixing chamber, and had introduced the very brainy idea of a Union Jack burner! They could understand from this that there would be nothing but a visible flame within the mixing tube, any amount of smell, and no heat whatever. They had the table taken down to the gas-works and fitted with proper burners at a cost very much less than the charge made by the Aberdeen tradesmen for one of the repairs alone. Further, it was worthy of note that the repair had given absolute satisfaction to the proprietor of the restaurant. This was only one of many instances he could relate of the way in which the master plumber carried out his work among gas consumers. In Aberdeen, they did not care to interfere with the work of the master plumbers because, being a gas corporation and the plumbers having representatives of the trade as members of the Town Council, they had to be wary in the way they proceeded. Frequently complaints came to them from parties who had gas-fires which were their own property. They were asked to go and attend to the fires because they were not satisfactory. In such cases, they advised the parties to get a plumber, because it was a private affair. When, however, it was represented that plumbers had been called in repeatedly and could do nothing, the Gas Department did not hesitate to go forward, and do what service it could render in the way of giving satisfaction. Frankly, he (Mr. Milne) did not know that he was altogether favourable to the idea of forming a Committee representative of the membership of the Association to consider what could be done to remedy existing grievances. A Committee could be formed if they cared to do so, but he was not over-sanguine of its success. For one thing they knew that house proprietors had been badly hit just at present, in that it had not been found possible for them to raise their rents to an economic level. On this account, he feared there would be the greatest difficulties raised in regard to the renewal of service pipes.

Mr. J. W. NAPIER (Alloa) ventured the opinion that the subject matter that Mr. M'Lusky dealt with in his paper was of immediate and paramount importance for the future of the gas industry. It seemed to him that the immediate circumstance of a gas department having to cease its activities at the border-line of private property, or at the meter, was an element that was simply disastrous to the progress of the industry. Indeed, if they looked at the matter broadly, it was clear that nothing short of legislation could effect a change. They all of them quite readily recognized that, if the warehouseman of to-day had to cease his activities at the doorstep of his own building, then his business would be very quickly a decreasing quantity. He had in his mind an interesting point as regards corporations and local authorities under the legislation governing the powers of a town council. In terms of this legislative power, a town council or local authority could call upon individuals and proprietors of buildings and houses to bear the first cost of forming roads and pavements. Following upon this the local authority or the town council became responsible for the future maintenance of these roads and pavements. The point had just occurred to him that local authorities and town councils should be vested with similar powers to call for the proper piping of houses; and when this work had been satisfactorily done, the question of maintenance should be dealt with, as in the case of roads and pavements. They would observe that as regards pavements the first cost was placed upon the individual owners in their private capacity, who were called upon to undertake this part of the work in the interest of the whole community. His view then was that as regards new buildings the piping for these should conform to a specification from the gas department. Immediately this had been done to the satisfaction of the authorities, the piping ought to be taken over and maintained by the gas department. Then as regards buildings already in existence, it did seem to him that the same principle could very well be applied and put into practice. Undoubtedly, unless some practice following upon these lines was carried out, and that through the process of legislation, it did appear to him that the gas industry was not reflecting its best purpose in the interests of the consumers. Proceeding, Mr. Napier said he desired to raise some mild objection to the statements made by certain members in the course of the discussion, that it was a mistake to supply too low a quality of gas. It must never be forgotten that the Gas Regulation Act, which had given so much freedom to their local authorities, was based upon the wide question of economics—namely, What is the best efficiency in the interests of the nation, having regard to the conservation of its most valuable asset—coal? Was not the highest or the best efficiency that which was going to give the largest commercial value from this asset? Parliament in its wisdom granted to the gas industry the Gas Regulation Act, and thereby gave the industry the right to take from the coal the greatest amount of value. Furthermore, it was a value that was going to operate in the consumers' interests as regards price, because whatever economical results there were in the manufacture of gas by the new method would undoubtedly be reflected in the price of the commodity to the public. Then he felt rather surprised that Mr. Milne, with his acute northern intellect, should have suggested that main pipes and service pipes would require to be increased in size. This was a fallacy which ought to be at once condemned. There was no excuse for any gas company providing at the present time an insufficient supply of gas. They knew quite well that the possibilities of high pressure and of boosting were such as to give every gas undertaking—even with the main pipes as they at present exist—an ample and full supply.

Mr. THOMAS CARMICHAEL (Portsmouth) did not propose to traverse any of the points raised by the previous speakers; but he believed that what they were doing in Portsmouth in fitting-up new houses there might be of interest to the members of the Association. In Portsmouth the Corporation had entered into competition with the local plumbers in regard to the erection of new houses. It had been decided that the gas-fittings for these dwellings should not be carried through by the local plumbers. Of course, it had been represented by the master plumbers that this was unfair competition. Up to a point it might be considered in the nature of competition that was rather unfair; but the retort which could fairly be made in reply was that the plumbers had brought it entirely upon themselves by their own carelessness in the past. In Portsmouth, they were putting in the service-pipes up to the meters, and they were charging for all service-pipes on private ground. In addition, they charged also for service-pipes more than 30 ft. on public ground. On the South Coast, and indeed generally all over England, experience had gone to show that the highest peak load might be expected for about two hours (or perhaps three hours) on Sundays. In Portsmouth between the hours of eleven o'clock a.m. and two p.m. on Sundays they reached the peak load. The peak load was higher at that period than at any other time in the course of the whole week. If this was the general experience—and certainly it was the experience in England—it was going to be a very expensive thing to cater to the backbone of the business as Mr. M'Lusky pointed out. It would be rather unfortunate if they had to make high-pressure arrangements to cope with a demand that was only likely to continue for two hours in a week.

Mr. CHARLES FAIRWEATHER (Kilmarnock) said he was ready to agree that complaints from consumers were very common; but he did not know in all cases that the complaints were being attributed to the proper causes. In recent years, because of circumstances arising from the war, it had been somewhat difficult for gas companies to cope with all the conditions that arose. For the most part consumers did not seem to realize that the exercise of a little care and trouble by them would go a long way towards minimizing their gas bills.

Mr. T. W. HARPER (Ayr) observed that for a period of three months he did not send out any gas above 420 B.Th.U.; and during this period he was bound to admit that he never had fewer complaints. Experience disclosed that the most common complaint in Ayr arose when they dropped down to 380 B.Th.U. They tried an experiment with that standard during a week-end, and quite naturally by Monday morning he found awaiting him a host of complaints. In the town of Ayr, they had carefully followed out the principle of fully and exhaustively investigating every case of complaint. If it was thought that the meter was at fault, a larger one was put in; and if they found that the landlord was reasonable, they put in larger piping to suit the needs of the consumers. Generally, the landlords in the Ayr district were reasonable. If a landlord was presented with a moderate estimate, and if he was satisfied that the piping was at fault, and that newer and better connections would remove the grievances, he rarely stood long in the way. In his (Mr. Harper's) view, it was not correct to say that low-grade gas was a prolific ground of complaint. In Ayr, there were fewer complaints to-day—not more than 1 p.ct. at any time—than previously; and the standard never went beyond 420 B.Th.U. In Ayr, he was bound to admit that they did not have much trouble with the master plumbers. Of course, he conceded that they had a very considerable amount of latitude in many respects over a local authority hampered by legislative enactments and Provisional Orders. Where defective pipes in Ayr were found, the consumer was duly advised—that was to say, if it happened to be the consumer's own property. In other cases, due notification was given to the land-

lord. Quite recently in regard to two particular properties, the threat was held out that if proper facilities were not afforded, the gas would be cut-off entirely. This threat proved a speedy and efficacious cure for the trouble, because the properties in question were put into thorough repair by the landlord interested. In some other cases, a point was made of interviewing the landlord personally, and representing to him that it was absolutely necessary to have the pipes and connections put into good order. Speaking from his own experience, he was bound to admit that if landlords were interviewed personally by responsible officials from the gas-works, and the situation explained to them in a reasonable and fair way, they were not so bad as pictured or imagined. Of course there was always the type of landlord who would do nothing, and was adamant in his attitude. Where this happened the Gas Department made the cost of repair as low as possible, and induced the consumer to pay part of it.

Mr. DAVID FULTON (Helensburgh) remarked that Mr. M'Lusky's paper opened-up discussion on a subject that was very much talked about among themselves privately. He was quite certain on this account that practically all the gas managers present were familiar with the facts of the case. A great deal had been said that day respecting the merits and demerits of low-grade gas. His own view on this topic was that people did not seem to worry overmuch as to whether the gas was of a low-grade standard or of an enriched value, so long as they got good service. Good service with a low-grade gas meant that there must be good pressure, and where good pressure could be given he thought they could always be assured of efficiency and excellent results. There seemed to be an impression abroad that to change-over to a low-grade gas involved trouble and expense in making the necessary alterations to appliances. To his mind it was not an expensive process, nor was it exceedingly difficult. As a matter of fact, he himself knew towns where four girls had put the appliances in order in quite a large district. So far as the relationship between gas corporations and master plumbers was concerned, he could only give his own personal experience in Helensburgh. Probably in a residential town like Helensburgh they might be more favourably circumstanced and situated as compared with other centres; but the fact remained that in Helensburgh they had an excellent type of plumber. The relationship in Helensburgh was such that the Gas Department of the town could work hand-in-hand with the master plumbers, and an arrangement of this kind was, he was bound to admit, mutually beneficial. In Helensburgh, as everywhere else, they found that many of the old services and meters were much too small for the introduction of gas-fires; but even when they did encounter these deficiencies they did not experience much trouble. The town was a residential one, and the consumers were always ready to do what was required. In Helensburgh, they did not try to make any profit at all from the introduction of new services; and he thought it was rather significant that, in the course of two years, they should have been able to put in no fewer than 120 new services.

Mr. M'LUSKY, replying to the points raised in the discussion, said he had intended taking up in his paper a different subject altogether. In fact, he had proposed giving a contribution on cranes and the handling of materials. But, on reflection, he thought he would try to get together something that would be likely to provoke an animated discussion. He had been somewhat disappointed with the debate, because he had had the feeling that many more grievances would have been aired. Indeed, it occurred to him that if he was to question the womenfolk—the wives of the managers—he might be better able to gather all that was in their minds. Mr. Ballantyne had approached the question in a judicial frame of mind; and to a great extent he (Mr. M'Lusky) concurred in his views. Whatever they did, they must keep the legal position before them all the time. As Mr. Ballantyne had very sensibly pointed out, it was clear that before they began to talk to property owners and property law agents, they must be fully conversant with their Provisional Orders and their various local Acts of Parliament. Personally, he was quite glad that both Messrs. Ballantyne and Napier had touched on the legal aspect of this question; and, of course, even when writing the paper, he had always in view this—that whatever action they proposed taking must consistently be along legal lines. Candidly, he had to confess that he had a great deal of sympathy with the point of view that had been expressed by Mr. Bruce. It did seem to him that if a gas manager wanted to send out a gas of 500 B.Th.U. standard, he had a perfect right to do so. Very often a gas manager could prove quite satisfactorily that it would be more advantageous to him to continue to send out 500 B.Th.U. gas so as to avoid the expenditure that another manager would incur by reducing his standard. It was all largely a question of the balance-sheet. When a manager sat down (with the responsibility of a department on his shoulders) to work-out a balance-sheet, he was not the least disposed to save money that would be paid by the distribution department, if it was going to ensure inconvenience without any adequate return for it. According to what Mr. Fulton had told them, they had in Helensburgh (a residential district) a type of master plumber who was disposed to consult and co-operate with the gas manager. This, no doubt, was all very well for Helensburgh, and undoubtedly it was a desirable and harmonious arrangement. The situation, however, was probably a little more difficult in Glasgow, where the master plumbers had the most powerful Association in Scotland or anywhere else. As Mr. Ballanytyne had put it, the master plumbers when they attacked the Gas Department must be dealt with in the proper manner. Mr. Braidwood made reference to the Gas Regulation Act, and to the fact that gas was now sold by the therm. He (the speaker) followed Mr. Braidwood very closely; but he was rather at a loss to understand how the adoption of the Gas Regulation Act was going to get rid of complaints. To his mind, it could not be done. For instance, they could not reasonably go to a consumer and say: "We have adopted the Gas Regulation Act, and are giving you so many B.Th.U., and there it is." If they were to get the best out of the Gas Regulation Act, they must guarantee a sufficiency of gas and guarantee it steadily. He (Mr. M'Lusky) felt very strongly indeed on this question of the deficiency of internal pipes. He just wondered how many gas managers were clearly losing business because the internal pipes were unable to cope with the gas they were desirous of selling and anxious to sell? Were there not instances known to all of them—especially in towns where electricity entered into competition with gas—in which consumers could be found who said: "We are going to drop gas, and we intend using electricity now. We admit it is good gas, and we probably would prefer to have it; but we cannot get the pipes." In the course of the discussion, some member ventured the criticism that all the managers who had got their works equipped with a vertical retort installation ought to be selling cheap gas. It did not follow because a works had vertical retorts that there should necessarily be cheap gas. As a matter of fact, a vertical retort installation which was badly handled was the worst possible equipment for any gas-works. Speaking for himself, he could say quite candidly that he had had ocular demonstration of this contention long before now. Bearing on the point that Mr. Carmichael had touched upon, he just wanted to observe that it seemed a long time now since he (the speaker) did duty in Barking. It carried him back to 1906, when he fitted up the Public Library there with gas as against electricity. What he could not bear about the whole business was the disposition on the part of those connected with the gas industry to stand still and mark time. He rather agreed with those speakers who took the view that it was value which counted most of all in the end. Frankly, he did feel disposed to go the length of saying that it was all a question of value. If a consumer felt at the end of the quarter he had got good value and good service, if even a little extra money had been expended, he was invariably well satisfied and content to make no complaint at all. The desire to give satisfaction to the consumer was, members should remember, the whole essence of his paper. It was the gas consumers who kept the gas managers in existence, and it ought to be the aim and ambition of the managers to give satisfaction by sending out gas at a reasonable price.

On the call of the PRESIDENT, a vote of thanks was passed to Mr. M'Lusky for his paper.

MIDLAND ASSOCIATION AT CHELTENHAM.

As was the case with a number of other fixtures, the spring general meeting of the Midland Association of Gas Engineers and Managers had to be postponed until conditions were more favourable. Happily, though the position generally is still far from what would be wished, the coal miners are at work again, and things generally have smoothed-down to an extent which permits of these arrears in the holding of meetings being caught-up. Let us hope that the postponements will in all instances prove to have in no way affected the success of the meetings when they do take place; and if last week's function may be regarded as representative of those to follow, this hope will be realized. On the invitation of the President (Mr. James Paterson, M.A.), the Association had been invited to visit Cheltenham; and there was last Thursday morning a gratifying muster of members, in gloriously fine weather, to take advantage of this opportunity of increasing their knowledge of a works that enjoys a good reputation in the gas industry, and to support a President who is deservedly popular among his professional brethren.

Many, of course, had been there before; for, at any rate on two previous occasions, the Midland Association had visited Cheltenham. But these other occasions were long ago; and since then the gas industry has fallen on evil days. Look where one will, it is impossible to find an undertaking that has not suffered; and it would be idle to expect the Cheltenham Gas Company to have proved an exception to the rule. Peculiar circumstances—it will be remembered that there was a six-weeks' strike of the employees last year—have pressed more hardly upon the shareholders there than has been the case with many companies; but nevertheless it cannot be said that the consumers have been affected to a corresponding extent. While the Directors felt compelled altogether to pass the dividend when submitting the report on the operations during 1920, the price the consumers are at present asked to pay for gas is no more than 5s. 6d. per 1000 c.ft., or 1s. 2d. per therm, which, under present conditions, and considering the position of the industry generally, cannot be regarded as an unduly high price for an undertaking with an output, like Cheltenham, of about 420 million c.ft. per annum, though it compares there with the extremely favourable charge of 2s. 1d. per 1000 c.ft., or 1s. 11½d. net, which was in force in 1914.

Cheltenham has already enjoyed a supply of gas for over a hundred years; and it will not be the fault of the Gas Company if the citizens are not similarly privileged by the close of another century. In the extent of the site on which the works are erected there is provision for the meeting of any reasonable future requirements; while the plant has been designed with like foresight. This "roominess," in fact, is characteristic of the place; for it is believed that Cheltenham, with its many parks and open spaces, has the largest area per head of the population of any town in the kingdom. It is true the recent census reveals a slight falling off, to the extent of about a thousand, in the population of the town, as compared with what it was when the last preceding one was taken; but everything is abnormal just now, and there is no reason for supposing that, with a return to more settled conditions, the natural and other great advantages of Cheltenham will prove less attractive in the future than they have done in the past. Increasing prosperity is confidently anticipated; and in this the Gas Company will assuredly fully participate. As has been remarked, they are in a position to seize opportunity as it may present itself. Only a short time before the outbreak of war a new station was brought into service, which had been built on land acquired nearly twenty years earlier; and after having been

greeted by the President, the visitors were taken to inspect this portion of the works, some illustrated particulars of which will be found in the "JOURNAL" for March 3 and 10, 1914, pp. 566, 644.

In affording full explanation of the various details, Mr. Paterson was assisted by Messrs. L. E. Twycross (Chief Assistant), J. Kane (the Works Superintendent), John Aston (Cashier), H. J. Humphris (Distribution Superintendent), and James Hambling (General Foreman). The new station was approached from the viaduct on to which wagons run from the main railway lines; and here it was noticed that the method then in vogue of unloading coal wagons by means of small tip-bogeys pushed by hand has been superseded by a more modern plan. Horses have been displaced on the viaduct by a locomotive; and a Babcock and Wilcox tippler, operated by an electric motor (which turns the wagons, rigidly held in a circular frame, practically upside down), has been installed for feeding the breaker direct. In this way, a 10-ton wagon is unloaded in from four to five minutes; and two men and one locomotive do work which previously required nine men and three horses. The retort-house, containing ten settings of nine retorts, or 180 retorts in all, is fitted with West compressed-air stoking machinery, the power for which is produced in a house adjoining. Under the latest arrangement, the coke, after falling into a tip-bogey, and being quenched by finely-divided streams of water from an overhead tray, is run out, and tipped from the bogeys into a telpher skip holding a ton, which is let into a hole in the ground. It is then elevated, and tipped either into a hopper over the coke-crusher or else on to the store heap. The installation of a coke-breaker has enabled the Company to secure an extra price of 1d. per cwt. for the coke which is passed through it. The plant house, with its battery of nine condensers, &c., was much admired; and some time was also spent over the two Bryan Donkin exhauster units working in parallel. Then attention was drawn to the sulphocyanide plant on the Williams process. The gas goes through this before being purified—one of the catch-boxes being used for the purpose. All the bricks for this new No. 2 station were made on the site; and at the time of last week's visit they were busy making bricks for new workshops, the foundations of which are already in.

OLD FRIENDS.

Well pleased with all they had seen, and after many appreciative remarks with which the name of Paterson was associated, the members proceeded to the Board-room, where luncheon was served to the party, which numbered nearly sixty. Here the President was in the chair, and was supported by the Vice-President (Mr. W. H. Adams). The Directors of the Company present were Mr. H. A. Thomas, Lieut.-Col. E. V. Thompson, and Mr. E. L. Baylis. Mr. J. Wesley Whimster, of Bath, also attended as President of the Southern Association of Gas Engineers and Managers; and it was announced that Mr. A. W. Sumner (the President of the Eastern Counties Gas Managers' Association) had up to the last moment hoped to be able to attend. The presence of Mr. W. R. Cooper, of Banbury (Hon. Treasurer, and an hon. member, of the Association), was referred to with particular satisfaction.

After the Loyal Toast had been honoured, that of "Prosperity to the Cheltenham Gas Light and Coke Company," coupled with the name of Mr. H. A. Thomas, was proposed by Mr. Hubert Pooley, of Leicester, who remarked that he had been fairly intimately acquainted with the Cheltenham undertaking for a considerable number of years. He also knew very well indeed Mr. Paterson's grandfather, who was a wonderful old man. They saw his name in connection with coal analyses in such works as "Newbigging's Handbook," and honoured his memory. Of Mr. Robert Paterson they need say nothing in Cheltenham. He served the Company with exceeding ability, and was respected, and equally loved, by everybody who knew him. And the son must not be excluded from the sentiments he had just expressed with regard to his father. They all knew Mr. James Paterson, and his good work for the Company, and congratulated the Directors upon possessing his services. In the works they had that day seen many things which had excited their admiration; and the whole lay-out promised to be splendid when the scheme was completed. For all this, every credit was due to the Directors and to the Patersons, father and son. It was their hope that Mr. James Paterson might be spared for many years to serve the Company, and thus be able to complete the work which had been so ably begun.

In acknowledgment, Mr. H. A. Thomas remarked that he had been very much impressed by the high standard of efficiency exhibited by those engaged in the gas industry. All they wanted in the future was fair play; for this was just what he ventured to think they had not had in the past. No industry had been so unfairly assailed as the gas industry, which had always worked for the public good, and at very small profit to itself—a profit which of late years, through the war and other causes, had sometimes reached vanishing-point. He thought, however, they had now turned the corner. They had got the Gas Regulation Act, which, though doubtless not all they could have desired, would be made the best of. It was, perhaps, somewhat unique for a son, father, and grandfather to have been in charge of the same works. Thus the engineering policy of the undertaking and its initiation was due to these three generations.

The toast of "Success to Kindred Associations" was then submitted by Mr. B. W. Smith, of Walsall, and responded to by Mr. Whimster, who said this was the first time he had had an opportunity of attending one of the Midland meetings; and he was very pleased indeed to make so many new friends. It was also a pleasure to visit the works of his old chief, Mr. Paterson, under whom he had served for several years at Redhill. The position of the gas engineer was certainly not a bed of roses. The past half-dozen years had been extremely trying ones; but they had survived them, and were all now looking forward to a good time ahead.

Lieut.-Col. E. V. Thompson, proposing "The Midland Association of Gas Engineers and Managers," coupled with the name of Mr. Paterson, spoke of the good work accomplished by organizations of this character. Free exchange of ideas was of great value to all. Mr. Paterson was one of his oldest friends; and he was very gratified to find him at the head of such an excellent undertaking as he represented.

The President, returning thanks, said Lieut.-Col. Thompson was the newest Director, and was quite an acquisition to the Board. He looked forward to many happy years of work with him and his colleagues, and was glad to say the undertaking was now rearing its head above the thorny difficulties with which it had been surrounded. Mr. Charles Hunt, one of the founders of the Association, and their President in 1878, had written regretting his inability to be with them that day. In conclusion, the President pointed out that the Association had been to Cheltenham in 1882 and 1894—on each occasion under his father's presidency.

A VOTE OF SYMPATHY.

The President said they had now a little business to transact. In the first place, they were aware that their old friend Mr. R. H. Ainsworth, of Solihull, had lately passed away; and he would ask them, by rising silently in their places, to show their sympathy. Further, this was a case where practical aid was required; and he proposed that the Secretary should be instructed to send straight away a cheque for ten guineas to Mrs. Ainsworth. Unfortunately, their old friend had had a nervous breakdown in the times which had been so heavy for all of them.

The suggestion of the President was unanimously supported; and a number of subscriptions were handed in by those present.

NEW MEMBERS.

The Hon. Secretary (Mr. T. Thornton, of Rowley Regis) then read the names of the following proposed new members, who were duly elected on the proposition of Mr. W. G. S. Cranmer, of Willenhall: Messrs. T. H. Poulson, of Stafford; E. D. Wootten, of Malvern; A. A. Leonard, of Ironbridge; and F. Shewring, of Stratford-on-Avon (re-elected).

A PLEASANT AFTERNOON.

A visit was then paid to the beautiful Promenade; and after an enjoyable and restful time had been spent in conversation and in listening to the outdoor military band concert at the Winter Gardens, a move was made to the "Cosy Corner" near by, where tea was taken on the invitation of the President and Mrs. Paterson. When the hour for separating had arrived, Mr. J. Ferguson Bell, of Derby, gave expression to the feelings of everyone present, and he proposed a hearty vote of thanks to their host and hostess, and declared that one and all had much enjoyed their day at Cheltenham, and had greatly admired both the works and the scenery. The thoughtful kindness of Mr. and Mrs. Paterson had been a fitting finish to a very pleasant outing. Responding, the President assured the visitors, with evident sincerity, that nothing could have given his wife and him greater pleasure than to see the members muster in such large numbers, as they had done, at Cheltenham. They would look forward to seeing them again, either individually or collectively, on some future occasion.

A PORTABLE CUBIC FOOT GAS OUTFIT.

Development by the United States Bureau of Standards.

There has been described by Mr. S. R. Winters, and illustrated, in the Chicago "Gas-Age Record," a small portable cubic foot gas-container for testing purposes, recently invented by the United States Bureau of Standards. It has been patented, its use dedicated to the public, and it is now being manufactured in quantity production by one or more commercial firms.

The portable apparatus, as well as the regulation cubic-foot bottle in common use, is, says Mr. Winters, designed as an agency of gas and chemical laboratory companies, to make direct measurements, or as a standard for calibrating gas-meters. Likewise public service commissions and inspectors can employ the device in keeping check on gas provers used by gas companies and public utility boards. The compactness of the product of the Bureau of Standards is, perhaps, its outstanding claim to novelty and to usefulness. Mr. M. H. Stillman, the inventor, demonstrated its serviceableness afield, when he put it to practical use in the mid-continental gas-fields of Kansas, Oklahoma, and Missouri. Lest it be overlooked, another use which is credited to its performances is that of testing consumers' gas-meters on the premises.

The regulation cubic foot bottle, which towers head and shoulders above the recent contribution to gas-measuring instruments, weighs approximately 75 lbs. Give it a capacity of supply of water or oil as a sealing liquid of some 15 gallons.

and its bulkiness is evident. The new portable outfit stands barely 25 in. high, and when full of oil weighs about 40 lbs. It has a capacity for completely surrounding 1½ gallons of oil or other sealing fluid. By using oil, evaporation is maintained at a minimum, which factor is to be entered on the credit side of the ledger. The regulation bottle is subject to more generous evaporation, unless kerosene is employed as a sealing liquid.

Under operating conditions, the tank is first filled with oil of small vapour pressure. By raising a bell to its upper limit by the negotiation of a handle, a definite volume of gas is obtained. The size of this volume depends for a given apparatus upon the distance the bell can be elevated, which is the distance between two defined stops. Lower the bell to its initial position, and the same definite volume of gas is expelled. Anyone accustomed to calibrating meter-provers with the regulation cubic foot bottle can successfully apply his knowledge in the operation of the new standard of measurement.

The compactness of the newly-designed standard is such as to recommend it for transportation. Setting-up the new standard for a test is a simple performance. Merely remove the equipment from the case, pour into the tank the specified volume of oil, and only a few moments have elapsed between the preamble and the completion of the performance. One man can remove the outfit to the next station on the schedule.

GAS CONNECTIONS UNDER PRESSURE.

Among the papers presented at this year's convention of the Canadian Gas Association, was one by Mr. H. N. OSLER, Superintendent at La Salle Gas-Works of the Montreal Light, Heat, and Power Company, who declared that there are many advantages attending the making of large gas connections under pressure; and while probably few such connections are actually carried out, he does not think there are many that cannot be made with safety, and without interrupting the flow. There have recently been completed at La Salle Gas-Works a number of connections made under pressures varying from 25 in. to 40 in. water column, without interfering in the least with the gas flow or the normal working of the plant.

The installation of an additional 5 million c.ft. capacity purifying unit rendered necessary an extension to existing headers, which consisted of 30-in. cast-iron flanged pipes; the end of each being blanked with a cast-iron flange. Thus the difficulty which confronted the Company was that of removing the blank flanges, and replacing with 30-in. valves, without shutting-down the plant, which circumstances rendered extremely undesirable. The customary methods could not be considered, owing to the high pressure carried; and so the following plan was adopted: A 30-in. gas-valve was lowered down opposite the blank flange, with the gate opened, and a timber passed through the opening, which securely braced the blank. This held it in place while all the bolts were removed; and, using the same holes, the valve was bolted on with a proper gasket, and made gas-tight. A boring bar keyed to a cutting tool was then placed, through the valve, against the blank; the end of the boring bar projecting past the cutter carrier with an upset end which fitted into a split hollow collar fastened to the blank with tap bolts. The object of this fitting was to form a rest for the boring bar, and to enable the operator to withdraw the portion cut out. Sufficient play was allowed for the advance of the tool while cutting. A bonnet forming a chamber, and made from a piece of 30-in. pipe fitted with a stuffing box, was then attached to the valve; and rods supporting a feed screw completed the outfit, with the exception of the drive. For this a discarded worm-drive was employed; the gear being attached to the bar with a feather, thus allowing for the feed. A small motor furnished the power. This arrangement provides a gas-tight chamber in front of the work, so that when the flange has been cut through the piece may be withdrawn, together with the cutting tool, clear of the valve-gate into the chamber. The valve is then closed, and the work is completed; the outer ring from the original blank remaining in place. The job was carried through during the working hours of one day, with complete safety, and without any leakage.

Various connections of a similar character were instanced by the author, who remarked, on the subject of cost, that in each of these cases a valve happened to be necessary for the apparatus subsequently installed, so that its cost was not additional, and its exact location being immaterial it was placed next the existing mains. Where a valve was not required except for doing the work, the method might be considered expensive; and this expense would have to be weighed against the numerous advantages gained.

Price of Gas at Accrington.—At a meeting of the Great Harwood Council, on the 15th inst., Mr. Boothman drew attention to a report of the Accrington and District Gas Board containing a proposal to again increase the price of gas. He said he was surprised at the increase, especially as the Board were making good progress. The Chairman replied that, owing to the dispute in the coal trade, £16,000 was lost on the manufacture of gas, and a further £6000 by the non-sale of bye-products. The manager hoped, by a little extra charge now, to be in a position to reduce the rate next year. He agreed it was a very bad time to raise prices; but they were guided by their manager in making provision for the best ultimate return.

CORRESPONDENCE.

[We are not responsible for opinions expressed by Correspondents.]

How to Burn Coke.

SIR,—Mr. Marshall's article in your issue of yesterday is interesting, but not convincing. It does not raise the question of the difference between burning coke in an open fireplace and in a stove, but that of the difference between combustion with a thin and a deep fuel-bed.

Mr. Marshall seems to claim that there is some advantage in the deep fuel-bed, because there "we obtain the double reaction"—converting carbon dioxide first produced into monoxide, and then burning the monoxide. In what does the advantage of this process over that of burning to carbon monoxide directly consist? It is not at all clear to me; and from Mr. Marshall's subsequent statement that the "exothermic sensible heat of the CO_2 reduction is likewise realized," I am not at all sure that it is clear to him. But if I am wronging him here, I am ready to apologize to him.

J. T. DUNN.

Public Analyst's Laboratory, Newcastle-on-Tyne, Sept. 15, 1921.

REGISTER OF PATENTS.

Drying, Purifying, and Cooling of Gases.

No. 108,319.

THEISEN, H. E., of Munich, Germany.

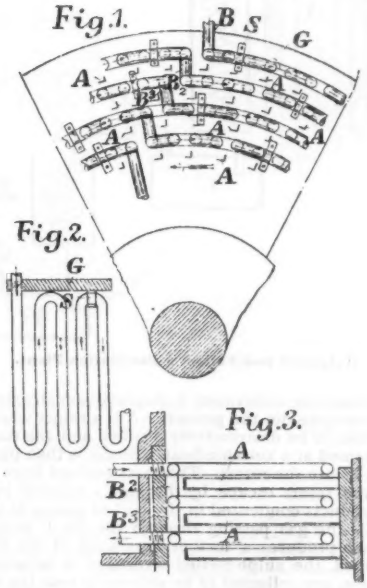
No. 10,611; July 24, 1917. Convention date, Feb. 28, 1916.

This apparatus for drying, cooling, and purifying gases, vapours, and other fluids or liquids and for separating any component or constituent parts contained therein is of the type in which a heat exchanging member and an atomizing member are arranged to rotate concentrically relatively to one another.

The heat exchanging member consists of a cylinder formed of a plurality of longitudinal conduits jointed together in series, and connected to a suitable system for circulating either hot or cold heat exchanging mediums; while the atomizing member consists of a cylinder formed of longitudinal arms arranged on a common base.

Another feature of the invention resides in the fact that the heating or cooling surface is repeatedly interrupted, and so disposed about the centrifugal device that the gases or vapours are forcibly "hurled" or "flung" not only in a radial direction against the heating or cooling surface, but are also made to pass along the latter tangentially—being repeatedly distributed and mixed.

Further features of the invention reside in the various arrangements and constructions of the conduits of the heat exchanging member.



Theisen's Gas Drying, Purifying, and Cooling Plant.

Fig. 1 is a partial side view of the main part of one of the constructions employed in carrying out the process. Fig. 2 is a plan of certain parts of the device. Fig. 3 is a side sectional view of such parts.

As illustrated, the round or square iron bars, heretofore used as atomizer surfaces, are superseded by a system of coiled pipes attached to a flat ring G, and so disposed that between the pipes there are provided atomizer surfaces formed of small angle-irons A rotating about the former. A portion of the coiled pipes, by way of example bent into U shape, is shown in fig. 2; while fig. 1 is a partial side view showing four cylindrical atomizer surfaces, and fig. 3 is a side sectional view showing three of the surfaces. The heating or cooling medium may be supplied at B and conducted through the serpentine pipes of the outermost coil in the direction of the arrows, whereupon it will pass

through the short connecting pipe B^2 into the U-pipes of the next concentric ring, travelling through the whole circumference of same, and passing at B^3 into the next following ring, and so on. By this means the heating or cooling medium is sent through the whole pipe-system in the direction of the arrows, from one ring to the other from the outside inward.

Now, if the gas flows from the inside outward, a radial counter-current is generated. If, further, the rotating atomizer surfaces—the angle-irons A—revolve in the reverse direction (indicated by the reverse arrow), another counter-current will be produced which will be peripheral. The heating or cooling medium, moreover, travelling (as fig. 2 shows) within the several pipe-coils alternately in opposition and transverse to the path of the gases, a third—practically transverse—counter-current is produced which is of particular efficiency. The pipe-coils or pipe-coil cylinder may be secured to the ring G by means of pipe-hangers S.

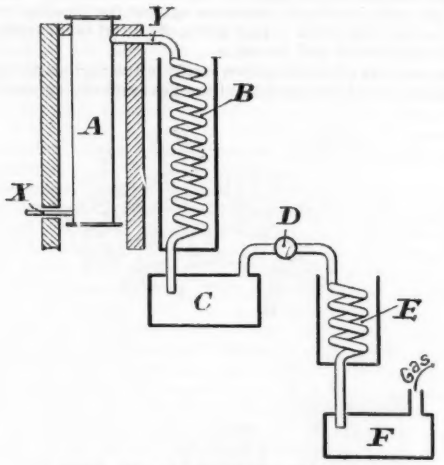
Destructive Distillation of Carbonaceous Materials. No. 143,223.

GUIGNARD, G. P., of Melun (Seine-et-Marne), and FELIZAT, G. L., of Paris.

No. 12,951; May 10, 1920. Convention date April 12, 1919.

This invention relating to the destructive distillation of solid combustibles—especially of schists, shales, peat, and similar carbonaceous materials—is characterized by the fact that the distillation is effected under a reduced pressure of approximately 620 mm. of mercury and in the presence of steam at or below a temperature of 350° C. The invention has for its object to diminish, without preventing, the production of the polymerization products; to destroy or prevent the formation of fixed or gaseous organic sulphuretted products; and to increase the production of ammonia by a better utilization of the nitrogen contained in the combustibles.

By the rapid removal of the compounds formed during decomposition, reciprocal actions of the compounds between themselves are prevented. The removal is effected by means of pumps or extractors of large capacity. The reaction is facilitated by the mechanical action of steam which acts in two ways—by cleaning the gases and the vapour produced by the destructive distillation of the combustibles, and by constantly changing the mean composition, and thus preventing the formation of a state of equilibrium and consequently diminishing or arresting polymerization. The steam has, in addition, a chemical action. The sulphuretted compounds (such as pyrites) are decomposed into sulphuretted hydrogen and metallic oxides. At the same time the formation of the sulphuretted organic compounds is prevented, and oxygenated compounds are obtained from which, by the ordinary process of destructive distillation, sulphuretted products are obtained.



Guignard and Felizat's Distillation Plant.

In the accompanying illustration is diagrammatically represented the apparatus for carrying out the process. A is a retort which is charged with combustibles to be destructively distilled and the temperature of which is maintained at a suitable heat. Steam is then passed through the small pipe X into the retort. The gases evolved from the products contained in the retort escape by the pipe Y assisted by the fan D. The volatile products condensed in the coil of piping B are separated in the vessel C—the gas passing through the fan D to the refrigerating coil E, which produces a further separation of the liquids. The gases are purified, the sulphuretted hydrogen is separated, and the combustible gases are collected to be utilized to heat the retort.

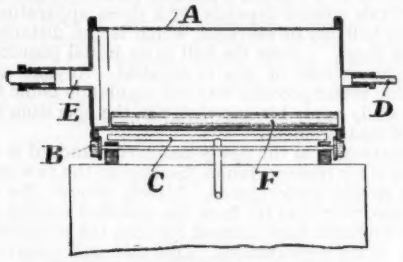
A distilled schist according to the proposed process has yielded the following results: The escape of the volatile products has been complete because from this schist which contains 36 p.ct. of volatile materials has been obtained 35·7 p.ct. No polymerization is effected because no trace or sign of tar has been obtained. The sulphuretted hydrogen produced by the chemical action of the water or steam is produced at or above 140° C.

Distillation of Coal.—No. 146,287.

FISCHER, F., of Mülheim-Rühr, Germany.

No. 17,174; June 24, 1920. Convention date Nov. 13, 1916.

According to this invention a long cylindrical pipe—for example, of 1·50 m. length and 50 cm. diameter—is preferably used as a retort for the intermittent distillation of coal; being rotated around its horizontally disposed longitudinal axis. Into the charge of pulverized coal in the pipe is placed a solid iron roller of the same length as the retort and about 10 cm. in diameter. When the retort is heated and rotated, the pulverized coal, as soon as it becomes plastic, bakes and clings on the inner wall of the retort, completely covering it. As the roller (which lies loosely in the interior of the retort) always tends to move towards the lowest point, it rolls, as the retort turns, the coal which is being distilled into a compact mass, the compactness being increased according to the plasticity of the coal.



Fischer's Coal Distillation Process.

In the longitudinal section shown of the apparatus, the retort consists of a drum A, mounted on rollers B over a gas-pipe C provided with burner nozzles, and rotated. At the centre of both ends of the drum are provided tubular trunnions—the trunnion D for the admission of steam and the trunnion E for the outflow of the gases containing tar. In the drum is loosely placed a roller F, which on the rotation of the drum rolls over the semi-coke lying on the drum wall and rolls it into a compact mass.

When the dry distillation of the coal has been completed, the coke-coating of the retort which has been formed commences to collapse; and on opening it the whole retort will be found coated with a uniformly thick layer of semi-coke. In an experiment on a small scale it was possible, for example, to obtain from 15 kg. of gas coal, 11·3 kg. of dense semi-coke and 1·5 kg. of tar oil—therefore about 75 p.ct. of semi-coke and 10 p.ct. of oil.

The patentee says: The raw oil obtained is volatile and has a calorific value of about 8400 calories. The semi-coke produced forms a good transportable, solid, smokeless coke, and upon its properties depends the practicability of the whole process, which at one stroke produces large quantities of heating oil and on the other hand smokeless coke. Naturally also, when carrying out the process, all means can be used to remove the reaction products more rapidly—as, for example, the admission of steam or the employment of a more or less high vacuum. All coals or coal mixtures, which have the capability of baking, are suitable for the purpose. No binding agent is necessary.

Coin-Freed Mechanism.—No. 165,483.

VICKERS, LTD., HIBBERD, C. E., and GOAD, F. L., of Westminster.

No. 333; Jan. 5, 1920.

This coin-freed mechanism is of the "screw and nut" type in which the adjustment of the amount of gas supplied by meter on the insertion of a coin is effected by a disc incorporated in the mechanism so as to indicate (by a movable pointer and fixed dial disposed within the operating handle of the mechanism) the amount unconsumed.

The invention is shown [p. 665] by way of example applied to a dry meter. A change price disc A is provided with a coin slot B and peripheral serrations enabling it to be set in different rotative positions. It is clamped by a locking plate bearing a pin engaging the serrations. Behind the disc a coin-slot closing disc F is mounted rigidly on a sleeve supported on a boss forming part of the main frame passing through a central hole in the rate-change disc, and having attached to it a handle K for operating the disc, which is formed with the usual slot and coin pocket L to enable the coin temporarily to lock it with the teeth of the crown wheel M, and thus transmit to the latter the rotation of the handle in the usual manner. The coin wheel is carried upon a back end boss formed as part of the main frame and provided with an internally threaded portion engaging the differential screw P passing freely through both bosses.

A spring-pressed pawl Q is disposed above the crown wheel, and engages ratchet teeth thereon, so as to permit rotation in one direction only. By arranging the pawl above the crown wheel, its weight is utilized to augment its engagement with the teeth, "whereby failure to operate due to pawl-spring breakage is removed."

The screw P carries at its rear end a pinion wheel R; and its front end bears an indicator guide plate S, comprising a disc formed with a radially projecting lug. This guide plate is secured to the end of the differential screw by a screw, but it is capable of free rotation about the axis thereof, its function being later on explained. Immediately surrounding the screw P is a tube formed with a spiral slot V. The frame-bearing is provided with a longitudinal slot W into which the end of the projecting lug upon the guide plate S enters in addition to passing through the spiral slot V. By this means, during longitudinal movement of the screw P (irrespective of its rotation) the lug is restricted to a longitudinal path, and the indicator sleeve U thereby caused to rotate according to the pitch of the spiral groove V.

A pointer X is carried on the front end of the sleeve, so as to indicate the position of it on a fixed dial disposed within a central annular recess Z formed in the operating handle, and preferably closed with a glass cover.

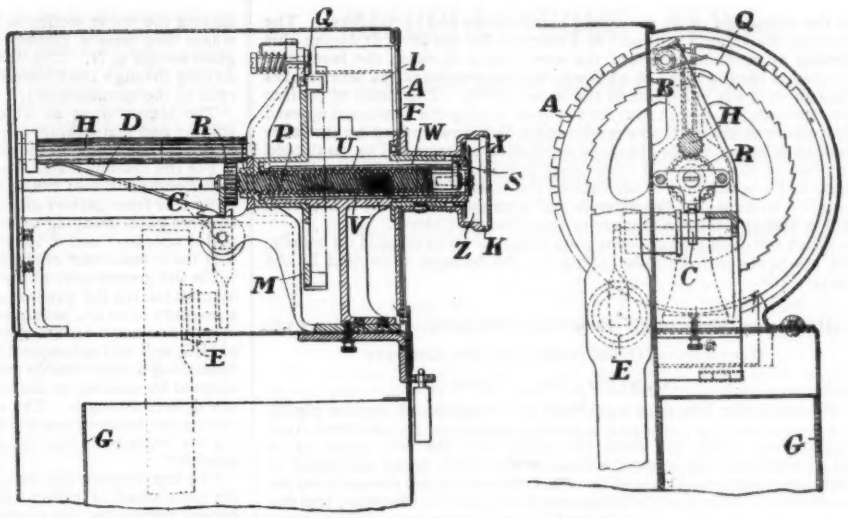
The back end of the differential screw is carried in a guide plate, which slides conveniently upon two guide rods held between frame brackets. The plate has a depending projection adapted to engage a tripping lever C at one end of the travel of the differential screw. The

lever carries a cam-shaped projection at its upper end provided with a strip D to ensure that the guide plate projection retains the lever C in position, holding the valve E fully open except when the projection enters the slot in the tripping lever and thus closes the valve.

The whole mechanism according to this construction, say the patentees, is disposed in small compass, and can conveniently be adapted within the width of meters of ordinary construction—general compactness being considerably augmented by permitting the differential member (which is threaded for substantially its full length) to pass through the change-price disc.

A cover plate surrounds the mechanism, and is so arranged that on removing a single screw the upturned lip of the cover is removed *en bloc* and replaced by an end disc, so that the meter is still serviceable.

In operation, the coin is inserted through the disc A into the coin pocket L. In this position the coin connects the pocket with the teeth of the crown wheel M. On the rotation of the hand wheel K the crown wheel is turned through an angle depending upon the position in which the disc A is set, and thereby moves longitudinally the differential screw P to a definite extent. This movement causes a definite degree of rotation of the indicating sleeve W, the latter movement being indicated by the pointer X in conjunction with the dial P within the handle. The coin falls into the money-box G, which latter is removable from the front of the mechanism by unlocking the padlock attached. As the gas is consumed, the operating mechanism of the meter rotates the long pinion; and since this meshes with the small pinion R carried on the differential screw, the latter is rotated within the now fixed coin-wheel M and moved longitudinally in the opposite direction to that in which motion was communicated from the handle. This motion is continued until the guide plate projection engages the tripping lever C and partially rotates it to close the supply valve E.



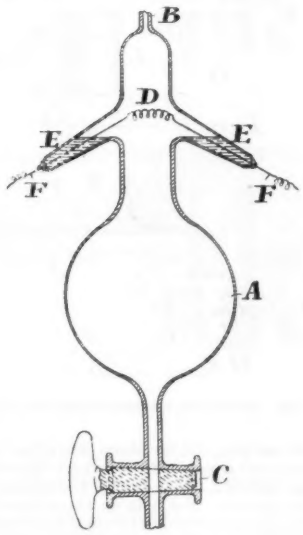
Hibberd and Goad's (Vickers, Ltd.) Coin-Freed Meter.

Gas Analysis Apparatus.—No. 167,280.

SOUTH METROPOLITAN GAS COMPANY and SOMERVILLE, J. M., of Old Kent Road, S.E.

No. 12,377; May 4, 1920.

The patentees point out that glass vessels containing a wire which is to be heated to incandescence by an electric current and is itself sealed in the glass or directly connected with wires sealed in the glass, are liable to be cracked by the heat developed in, or conducted to, the part of the wire sealed in the glass. By their invention this trouble is avoided or minimized by forming the glass vessel with internal cavities adapted to contain a suitable liquid or solid, and so formed that the wire which will conduct heat from the incandescent wire extends through the liquid or solid before it touches the glass at the seal, and that the wire touches the glass at no point other than the seal. In this manner the heat of the wire is conveyed to a comparatively wide area of glass so that there is less liability to cracking than when it is in contact with glass at a point where it is not surrounded by liquid or solid. The invention has particular reference to apparatus for the analysis of gases.



Somerville's (South Metropolitan Gas Company) Gas Analysis Apparatus.

In the gas pipette shown, A is a well-known form which is used by filling it with mercury or other suitable liquid, connecting it at the upper tubulure B with the source of gas to be treated, and then allowing the liquid to flow through the opened stop-cock C. The gas entering the pipette passes over the incandescent wire helix D. The upper part of the vessel is formed with the arms E constituting cavities into the ends of which the conducting wires F are sealed. As the liquid leaves the vessel, some of it is retained in the arms and surrounds the wires therein, thereby operating in the manner described.

When mercury is not used and it is preferable to fill the arms E with a solid material, a metal of suitable melting point may be melted into, and allowed to solidify in, the arms before the upper part of the apparatus is finally formed.

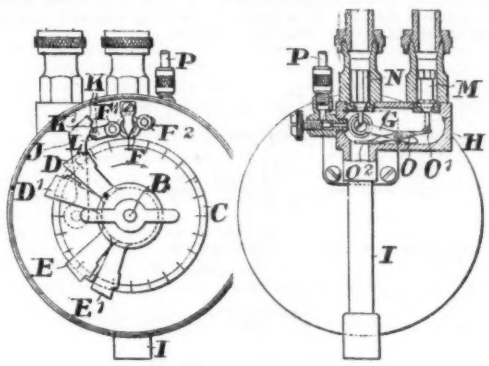
Gas-Controllers.—No. 167,392.

HUME, G. W., of Southwell, and FORSTER, J. D., of Hyson Green, Nottingham.

No. 23,246; Aug. 7, 1920.

This invention relates to gas-controllers as described in patent No. 10,965 of 1912—designed for lighting a burner (or group of burners) from a subsidiary burner or pilot light.

For this purpose a horizontally sliding double-seated lift-valve is employed (controlling the supply of gas to the two burners), reciprocated by a rocking lever actuated by a pair of tappet arms operated by clockwork, so that when the valve is moved in either direction it closes the supply of gas to one burner and opens it to the other.



Hume and Forster's Gas Controllers.

The illustration shows a front and a sectional rear view of the controller with two valves for regulating the supply of gas to two burners or to two groups of burners.

The casing of the controller contains the arbor B of a clock mechanism carrying a 24-hour dial C, and a set of two adjustable tappet arms D E, for actuating the rocking lever F through the medium of the rollers are shown. The lever has a valve actuating arm G within the valve casing H, which is supplied with gas through the pipe I. J is a spring trip-lever having cam surfaces K for engaging a pin L on the lever F. [All the foregoing parts are described in the former specification.]

M N are the two lift-valves employed, the valve M being lighter than N; and O is the tappet lever pivoted freely to the arm G of the lever F. This lever is pivoted about midway between its ends, which are designed, when the arm G is raised, to come into contact with the stems of the valves and lift them successively from their seats to allow gas to flow to the burner which they control. D^1 E^1 indicate an additional pair of adjustable tappet arms on the arbor B.

In the operation of the valves assume that they are closed with one end O^1 of the tappet lever O in contact with the stem of the valve M. If, now, the arbor B be rotated by the clockwork, the tappet arm D will, in passing beneath the left roller, rock the lever and consequently the arm G so that the pin L on the lever will snap into the recess between the cam surfaces K on the trip lever J. The tappet arm D^1 will then by the continued rotation of the arbor also pass beneath the same roller and still further rock the lever so that the pin will be forced out

of the recess and on to the upper cam surface of the trip lever. The stem of the valve N still acts as a fulcrum for the lever O during this further upward movement of the arm G so as to cause the lever still further to lift the valve M until a turned-up portion of the lever makes contact with the underside of the valve casing. This point of contact now constitutes the fulcrum for the lever during the continued upward movement of the arm, so that the valve N is now opened by the lever and admits gas to the burners controlled thereby. The continued rotation of the arbor will then bring into successive action the tappet arms E E^1, which will in turn act on the lever F and consequently the arm G—to close first the valve N and then the valve M by the lever O which acts in a reverse manner to that described above.

P is a bye-pass pipe in connection with the valve casing H for supplying gas to one or more pilot lights for the burners controlled by the valves M N.

Filters for Use with Dry Gas-Meters.—No. 167,435.

HUCKSCHLAG, H., of Bonn-on-Rhine, Germany.

No. 36,617; Dec. 31, 1920.

This invention relates to a gas-filter to be introduced into the piping in advance of a dry gas-meter to prevent impurities and moisture from reaching the meter, and from interfering with the free action of its valves and other mechanical elements—the filter being composed of concentric perforated screens or shells through which the gas is led for purification. The thimble is suspended vertically in the pipe; and the outer wall of it has an unperforated lower portion to collect the impurities and the moisture shed inside the filter—the internal shells being preferably of semi-circular cross-section, so that the parts can easily be disassembled and easily cleaned.

Manufacture of Ammonium Sulphides.—No. 167,540.

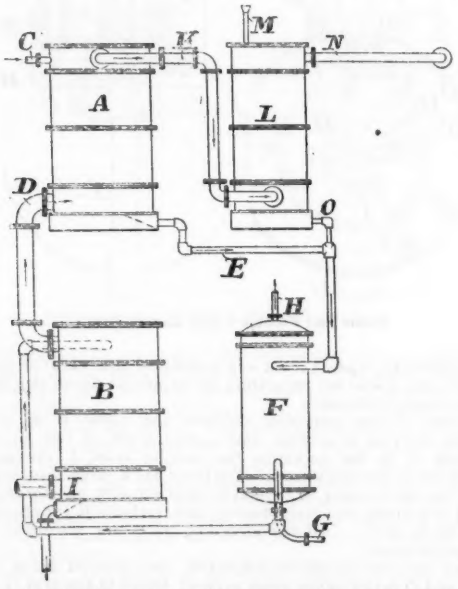
SOUTH METROPOLITAN GAS COMPANY, and PARRISH, P., of Blackheath, S.E.

No. 12,040; April 30, 1920.

The patentees' specification is as follows: In the distillation of ammoniacal liquor to produce ammonia solution, the liquor is first heated in a preliminary still for the purpose of expelling, as far as possible, the sulphuretted hydrogen and carbon dioxide which it contains, and is then distilled to obtain ammonia solution. When it is desired to make ammonium sulphide, it would be an obvious economy to refrain from expelling sulphuretted hydrogen from the liquor and to allow it to distil together with the ammonia. Hitherto, however, there has been the difficulty that if the sulphuretted hydrogen is allowed to distil with the ammonia, it is accompanied by so much carbon dioxide that the distillate contains more ammonium carbonate than is desirable, and indeed so much that crystallization is liable to occur, causing much trouble.

Ammoniacal liquor varies in composition according to the conditions of carbonization and gas purification adopted at the gas-works or coke-ovens which produce the liquor.

This invention relates to ammoniacal liquor as it is usually produced at large works—namely, of a strength varying between the grades known in the trade as 6-oz. and 10-oz. liquor.



Parrish (South Metropolitan Gas Company's) Ammonium Sulphide Process.

The preliminary still commonly used is shown diagrammatically. It consists essentially of a column still comprising an upper section A and a lower section B. The crude ammoniacal liquor is introduced into the upper section at C, and meets the steam and gases which enter the bottom of this section at D from the lower section B. Having passed down the section A, the liquor flows by the pipe E into a cooler F, where it flows around pipes through which a current of cold water passes from the inlet G to the outlet H. From the cooler, the liquor flows into the upper part of the lower section B, in which it meets a fresh stream admitted at the bottom through I. The steam and gases leaving the upper section at K enter the lower part of a column still L, where they meet a current of water admitted at M, and whence the gases escape at N. The water leaving the still at O joins the liquor flowing through the cooler F. The liquor leaving the lower section B runs to the ammonia still.

The temperature at which this still is operated depends on the volume and temperature of the steam admitted at I; and the pressure in the still depends on the depth of the water-seals in the columns.

For the reasons stated, the still has hitherto been operated under such conditions that the liquor leaving the lower section is substantially free from carbon dioxide and sulphuretted hydrogen—the whole of these gases escaping together at N. By the present invention the still is operated under such conditions of temperature and pressure that the greater part of the sulphuretted hydrogen remains in the still while the greater part of the carbon dioxide is expelled. For example, by maintaining the preliminary still at a temperature of 98° C. and at a pressure of 16 lbs. per sq. in. absolute, ammoniacal liquor of the kind in question may be practically deprived of CO_2 without appreciable loss of H_2S, and will subsequently yield on distillation an ammonia liquor containing a considerable proportion of ammonium sulphide and well-adapted for making an ammonium sulphide or polysulphide liquor of any desired strength. The aforesaid conditions are secured by maintaining the temperature at the steam inlet L at 98° C., and so adjusting the water-seals that the pressure at this point is 16 lbs. per sq. in. absolute.

The temperature and pressure at which the still should be worked are not limited to those named above. As would be anticipated from general principles, the pressure must be increased as the temperature is increased.

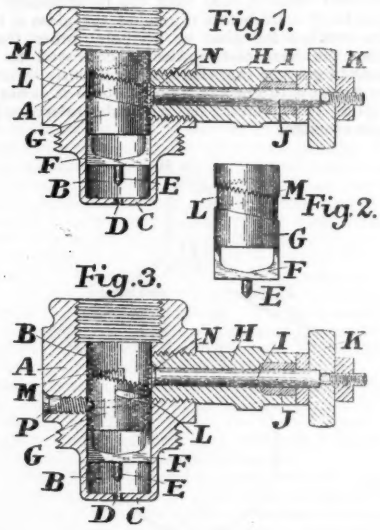
Much difficulty has been experienced in making ammonium sulphide or polysulphide liquor from ammonia liquor and gases containing H_2S. It has been found that this is because hitherto waste H_2S, which is considerably diluted, has been used. By adopting the practice of the laboratory—namely, by passing into the ammonia liquor high concentrated H_2S, such as is obtainable by decomposing iron sulphide by sulphuric acid—there is no difficulty in making ammonium sulphide liquor, or, if sulphur be added, ammonium polysulphide.

Regulator for Incandescent Gas-Burners. No. 167,657.

GLOVER, T., of Fitzjohn's Avenue, N.W., and the BLAND LIGHT SYNDICATE, LTD., of Little Trinity Lane, E.C.

No. 17,708; June 29, 1920.

In this regulator for incandescent gas-burners, a needle valve is attached to a tubular guide provided with teeth meshing with a worm or pinion on a turn-button stem—a spiral groove on the guide engaging a pin in the casing so as to ensure the guide moving longitudinally. The tubular guide carrying the valve is provided with teeth arranged along a spiral, capable of being engaged by a pinion on the turn button; the tubular guide being provided with means whereby, on the revolving of tubular casing and needle valve, they are caused to reciprocate and so open or close the gas spit.



Glover's (Bland Light Syndicate) Incandescent Gas-Burner Regulator.

Two examples of carrying the invention into effect are given. Fig. 1 is a sectional elevation of a regulator in which the spirally arranged teeth are cut in one wall of a spiral groove and engaged by a pinion on the stem of the turn-button. Fig. 2 is an elevation of the valve and tubular guide. Fig. 3 is a sectional elevation of a regulator in which the spirally arranged teeth are cut on the top edge of the tubular casing, and the casing is provided with a groove which is engaged by a pin to ensure the reciprocating motion.

A is the nozzle (with the usual screw-thread for attachment to the piping and mixing chamber) provided with a central recess B and one end wall C having a hole or spit D. Inside the nozzle is the needle valve E, which is carried by a bridge F extending from the tubular guide G. The nozzle is also provided with a sleeve H carrying a stem I and a gland J—a turn-button K being affixed to the stem I.

A spiral groove L, of the required depth, is cut in the outer wall of the guide G, the upper wall of which is formed with teeth M. The opposite wall is smooth. The stem is provided on its end with a pinion N, which meshes with the teeth M and approximately fills the groove L so that, as the stem is turned, the pinion meshing with the teeth causes the guide G to turn; and the pinion, also acting upon the smooth wall of the groove, causes the guide G to move end-on, and so move the valve E to or from the spit D, in accordance with the direction of movement of the stem I.

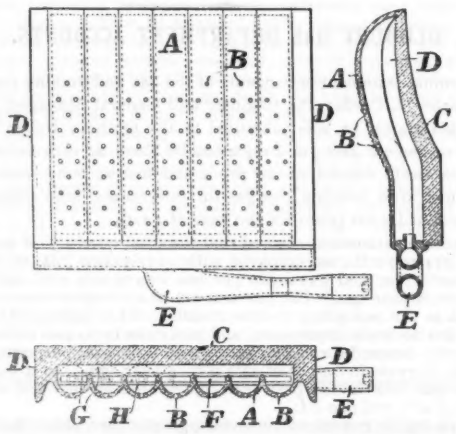
Instead of forming the teeth on one of the walls of the groove L, the end of the guide G may be of spiral formation, and teeth formed as in fig. 3—the pinion N engaging the teeth as before. To ensure a reciprocation of the tubular guide, the groove L, which in this case may be a slot cut right through, may be engaged by the end of a screw pin P inserted in the nozzle.

Gas-Fires.—No. 167,671.

STIMEX GAS STOVE COMPANY, LTD., and SAYNER, G. S., of Balham Hill, S.W.

No. 21,750; July 20, 1920.

A gas-fire according to this invention is illustrated in front elevation, vertical section, and sectional plan. The fire consists of an upright hollow slab of refractory material, having a front portion A of ogee profile, perforated with fine burner holes B, and an imperforated back C and sides D. The front merges into the back by a rounded



Sayner's (Stimex Gas-Stove Company) Gas-Fire.

surface. The gas mixture is supplied to the interior of the slab by a venturi mixture pipe E at the bottom, through a longitudinal slot F. The front face of the portion of the slab where it is licked by the flames from the burner holes is roughened or burred as shown by the sectional views.

The front portion consists of a series of outwardly convex corrugations, forming internal channels, which may be developed into separate tubes united by moulding the back thereon, as indicated by the dotted semi-circles G. In such case the mixture is supplied from the mixing pipe E to each tubular channel by a separate nipple, shown dotted at H, instead of by a slot F.

APPLICATIONS FOR PATENTS.

[Extracted from the "Official Journal" for Sept. 14.]

Nos. 23,536 to 24,147.

BATES, A.—"Manufacture of gas-regulators for incandescent burners." No. 23 659.

CANNON IRON FOUNDRIES, LTD.—"Plate-racks for use with stoves." No. 24,008.

CRANE CO., W. M.—"Gas ranges." No. 23,881.

GROVE AKT.-GES, D.—"Separating-apparatus for steam, compressed air, and gases." No. 23 960.

HAWTHORNE, H. S.—See Cannon. No. 24,008.

HODGETTS, J. H.—"Attachment for cock or tap of gas-fittings, &c." No. 24,074.

KERSHAW, H. & W.—"Means for drying, &c., air and gases." No. 23,835.

KNIGHT, J.—"Gas ovens or stoves." No. 23,656.

LOSS, O.—See Grove. No. 23,960.

MARSH, J. J.—"Manufacture of gases from oils, spirits, &c." No. 23,984.

NIECE, F. G.—"Cracking hydrocarbons." No. 23,856.

REYNOLDS, F.—"Manufacture of gas-tight seals between metal and vitreous material." No. 23,855.

RUSHEN, P. C.—See Crane. No. 23,881.

SCHOFIELD, F. H.—"Optical pyrometers." No. 23,743.

SILICA SYNDICATE, LTD.—See Reynolds. No. 23,855.

STANIFORTH, H.—"Gas-meters." No. 23,734.

THOMAS, C. W.—"Gas-fired kilns." No. 23,689.

TRUMAN, W. E.—See Hodgetts. No. 24,074.

YOUNG, W. H.—"Regenerator for gas-retorts." No. 23,986.

MISCELLANEOUS NEWS.

GAS REGULATION ACT APPLICATIONS.

The following further notices have appeared in the "London Gazette" of applications by gas undertakings to the Board of Trade for Orders under section 1 of the Gas Regulation Act.

Dorking Gas Company.

The maximum price now authorized in respect of the supply of gas by the undertakers is 5s. 3d. per 1000 c.ft. in the parishes of Dorking and Dorking Rural and the part of the parish of Mickleham within the Company's area of supply, and 5s. 6d. in the remainder of their area. The prices they have asked the Board of Trade to substitute for these are 2s. 1·88d. and 2s. 2·48d. per therm respectively.

Havant Gas Company.

The standard price now authorized in respect of the supply of gas by the undertakers is 4s. per 1000 c.ft.; and the price they have asked the Board of Trade to substitute for this is 1s. 10·66d. per therm.

Whitchurch (Salop) Gas Company, Ltd.

The maximum price now authorized in respect of the supply of gas by the undertakers is 4s. 7d. per 1000 c.ft.; and the price they have asked the Board of Trade to substitute for this is 1s. 8d. per therm.

DECLARATIONS OF CALORIFIC VALUE.

Brigg Urban District Council.—500 B.Th.U. (Oct. 1.)
Hemel Hempstead District Gas Company.—500 B.Th.U. (Sept. 25.)
Liverpool Gas Company.—475 B.Th.U. (Sept. 14.)

GAS REGULATION ACT ORDER.

The Director of Gas Administration has forwarded the following further Order made by the Board of Trade under section 1 of the Gas Regulation Act.

Strabane Urban District Council.

As from the declared date, (1) the maximum price in respect of gas supplied by the undertakers shall be 24d. per therm; (2) the words "one half of one therm" shall be substituted for the words "one hundred cubic feet" wherever they occur in section 14 of the Strabane Gas Order, 1902, as confirmed by the Local Government Board (Ireland) Provisional Orders Confirmation (Gas) Act, 1902 (2. Edw.7., C. XCV.). (Sept. 12.)

ALLIANCE AND DUBLIN CONSUMERS' GAS COMPANY.

The report of the Directors of the Alliance and Dublin Consumers' Gas Company for the half year ended June 30 shows a profit on the revenue account of £34,515; and, after providing for interest on the debenture stock and temporary loans, there remains a sum of £24,286, to which must be added the sum of £4317, the balance brought forward from the last account, and a credit from income tax amounting to £2691—making a total of £31,294.

Subject to the approval of the Board of Trade, the Directors recommend the maximum dividend authorized by the Alliance and Dublin Consumers' Gas (Temporary Increase of Charges) Order, 1919, on the consolidated ordinary stock of the Company, of £3 6s. 3d. p.ct. per annum, less income tax. This will absorb £25,703, and a balance of £5591 will remain to be carried to the next account.

The Directors regret that the Order for financial revision under the Gas Regulation Act, 1920, has not yet been received; but the stockholders will be acquainted of the revised terms immediately they are known.

The meeting will be held at the offices in Dublin on Thursday, the 26th inst.

AUSTRALIAN GAS LIGHT COMPANY.

The Annual General Meeting of the Company was held at the Chamber of Commerce, Sydney, on Aug. 8—Mr. GEORGE J. COHEN (the Chairman) presiding.

The SECRETARY (Mr. C. U. B. Gurnett, A.C.I.S.) having read the advertisement convening the meeting, the report of the Directors was taken as read. This stated that the net profits for the half year ended June 30, including the balance brought forward, amounted to £113,964; and after payment of the dividend recommended, there would remain a sum of £28,590 to be carried to the next account.

The CHAIRMAN, in moving the adoption of the report, said this was the 34th annual meeting he had had the honour to preside over as Chairman of the Company, and the 36th anniversary of his election to the Board. On the first occasion when he presided, he reported that the sales of gas for the twelve months ended June 30, 1887, amounted to 895,782,000 c.ft.; while for the last twelve months the consumption was nearly six times this amount. The number of consumers in 1887 was 22,027, and at the present time 163,124, of which 28,516 represented prepayment accounts. The residuals gross revenue had also developed from £23,845 in 1887 to the present annual return (for the year ended June last) of £306,567. The statement of accounts now before them clearly sets out the position of the Company. The consumption of gas showed a very slight increase; being 2·9 p ct. over that of the corresponding period of last year. The total gas sold amounted to 2,439,486,000 c.ft. There were 6796 public lights now in use, showing a decrease of 1725. This had been

brought about by the adoption of electric light by several of the municipal councils whose contracts with the Company had expired. The gross sales of residuals showed a satisfactory increase, which would have been much greater but for the decreased price obtained for sulphate of ammonia. There had been a substantial increase in revenue derived from both coke and tar. Requiring money to carry out the necessary extensions at Mortlake, the Directors decided to increase the capital by the issue of 25,000 new shares; and the disposal of these shares was being carried out under the procedure set out in the Gas Act.

EARLY HISTORY.

It had been definitely decided to vacate the head station on Sept. 30, after being in possession of it for over 80 years. In this connection, it might not be amiss to recount some part of the history of these works, which were the first of their kind in Australia. The Company received their Charter of Incorporation on Sept. 7, 1837 (just 84 years ago), when the Darling Harbour site was decided upon for the establishment of the works. The first consignment of plant arrived in Sydney by a vessel called "Ann" on May 15, 1839; the Company's first Engineer (Mr. James Bryan) arriving by the same ship. Owing to the great distance of the Colony from England, whence the whole of the plant had to be imported, and the heavy work requiring to be done in preparing the site, four years elapsed before the works were ready. The first demonstration of gas making was made on Her Majesty Queen Victoria's Birthday—May 24, 1841; and the works had been in continuous use ever since their establishment. As an example of the enormous growth of the Company, it might be mentioned that, while the maximum daily capacity of the Kent Street works was only 4½ million c.ft., the maximum daily demand experienced by the Company during the past winter exceeded 20¾ million c.ft. The programme of extensions was well in hand; and good progress was being made. The experience previously gained by the Company in the way of securing supplies of local material had been advantageously made use of; and almost without exception the whole of the plant included in these extensions would be of Australian manufacture. Since they last met, the reconstruction of the old carbonizing unit in the Mortlake works had been partly completed; and the first half of this reconstructed plant had been put into commission. Before the next meeting, it was anticipated that the whole would have been re-commissioned, with, it was hoped, improved results. The cost of this reconstruction had been a charge against the special purposes and depreciation fund. The agreement between the Company and their employees entered into last year had been loyally observed by both parties, and had been productive of such harmony as to warrant the hope that peace in the industry had been well established. The closer co-operation brought about as the result of the agreement had resulted in increased efficiency, and consequent benefit to all parties. Most of the trades employed by the Company have had their hours of labour reduced; and an application by the main body of the employees was at present before the Special Court constituted for the consideration of such claims. Should a reduction in hours be granted to the employees as a whole, the cost of the production of gas must necessarily be increased; and this increase would be reflected in the selling price of gas. The lease of the Company's showroom located at 266, Pitt Street, expired on the 31st ult. The Directors decided to remodel the premises at the corner of Pitt and Barlow Streets, Haymarket, with a view to transferring the showroom business there in conjunction with the general offices of the Company. These new premises were opened to the general public on the 25th ult. Though the Directors were exercising every economy commensurate with efficiency, the expenditure for the period under review had been high. There were, for instance, such items as increased cost of labour, amounting to £49,000; and coal and oil charges, amounting to £71,724. While there did not appear to be any prospect of a reduction in these particular items in the near future, it was hoped that the expenditure generally would show signs of abatement during the coming half year. In conclusion, he moved that the report be adopted, and that a dividend for the past six months be paid at the rate of 4 p.ct. on the old "A" and "B" shares, and in proportion on the new "A" shares.

The resolution was unanimously adopted; and the retiring Directors and Auditors having been re-elected, the proceedings concluded with a vote of thanks to the Directors and officers for their efficient management during the half year.

SHEFFIELD NOMINEE DIRECTORS' REPORT.

The annual report to the Corporation of the Nominee Directors on the Board of the Sheffield Gas Company states that the past year's working of the undertaking shows still further improvement on that of the previous five or six years. While there have been some reductions in cost, many of the materials used still remain at a high price; and wages have not yet been reduced to such a point as will materially ease the situation. The coal dispute caused the management serious anxiety; but it is gratifying to record that the supply of gas was maintained without the purchase of either foreign or outcrop coal. Under the Emergency Order of the Board of Trade, the pressure and calorific value were somewhat reduced; but, taking everything into consideration, the management are to be congratulated on keeping-up a constant supply of gas without rationing or reducing in any way the amount required by consumers.

Last year the increased cost of coal over 1919 was £82,304; while the amount paid in wages was £321,647, compared with £299,000 in 1919, and less than £118,000 in 1914. The quality of coal obtained last year was even worse than during the war; yet the standard calorific value was fully maintained. The amount spent in renewals and repairs has been very large; and the Board are sparing no effort to put the whole of the plant in perfect condition. A high-pressure main has been commenced, to boost the pressure in the Attercliffe and Heeley districts; and others will be laid in different parts of the city.

Tenders have been accepted for a 4 million cubic feet plant of 48 vertical retorts, which will only occupy the same space as that of a 1½ million horizontal plant. The installation will still further defer the time when it will be necessary to commence the erection of the new works at Wadsley Bridge, and will thus economize in the working of the undertaking.

The price of gas was reduced last year on the September readings from 4s. to 3s. 6d.; but owing to the slump in the price of residuals and the high cost of coal, it was fixed last April at 10d. per therm, equal to 4s. per 1000 c.ft.

During the year 1920, the quantity of gas sold was 5,059,943,000 c.ft., being an increase of 173,971,000 c.ft., or 3·56 p.ct., over 1919. The average price of gas sold was 3s. 9d. per 1000 c.ft., compared with 3s. 4·86d. in 1919.

The Company took advantage of the Gas Regulation Act, and applied to the Board of Trade for an Order. The maximum price at the date of the application was 4s. per 1000 c.ft., equivalent to 9⅜d. per therm for gas of a calorific value of 500 B.Th.U. The Company applied for a standard price of 1s. 2d. per therm, equivalent to 5s. 10d. per 1000 c.ft., an increase of 4⅜d. per therm, and at the same time intimated that they proposed to declare the calorific value of the gas they intended to supply as 480 B.Th.U., instead of 500 B.Th.U. as heretofore. The application was opposed by the Corporation; but the Board of Trade made the Order, fixing the new maximum price at 1s. 1⅜d. per therm.

By the same application, the Company obtained a modification of the statutory or other provisions whereby the rates of dividends payable, or any other payment, was dependent upon the price of gas supplied by the Company. This modification has enabled the Company to pay the dividends and Directors' fees on the same basis as before the increased price at which the Company were compelled to sell gas affected the rate of dividend and the payment of Directors' fees.

OLDBURY GAS DEPARTMENT ACCOUNTS.

The annual statement of accounts of the gas undertaking (signed by Mr. Charles H. Carder, the Engineer and General Manager), for the year ended March 31, was submitted to the Oldbury Urban District Council on the 7th inst., and regarded by them as very satisfactory. The gross profit carried to the profit and loss account amounted to £6476; and after meeting charges for interest and loan repayments, there remained a net profit for the year of £2264.

The working statement showed that the total quantity of gas made was 182,714,000 c.ft., as compared with 223,653,000 c.ft. in the previous year. The coal gas made per ton was 14,074 c.ft., as against 13,171 c.ft. a year ago. The gas sent out of the works was 18·5 p.ct. less than in the preceding twelve months. This falling-off was, of course, due to trade depression, and particularly to the cessation of a temporary demand for gas for power and industrial purposes, which caused an increase in output of 25·3 p.ct. a year ago. As a matter of fact, the gas sold in the past year represented an increase over the 1919 figure of 3,776,000 c.ft.

It is probably not many undertakings that are able, despite the effects of the coal strike, to make a reduction in the price of gas retrospective. Oldbury is in this fortunate position; and at the same meeting the Council, on the recommendation of the Gas Committee, approved a reduction of 5 p.ct. to ordinary consumers and 2½ p.ct. to power users, retrospective to July 1, and a further reduction of 2d. per 1000 c.ft. to ordinary and power consumers, and of ½d. in the shilling to slot consumers, as from Oct. 1. This is from the present price of 5s. 6d. to ordinary consumers, 4s. 8d. for power, and slots 14 c.ft. per penny.

In introducing the motion, Mr. K. M. Chance (the Chairman of the Gas Committee) said that the unknown factor was the extent to which the trade of the district would pick-up. Costs had been looked into very closely, and supplies had been bought well; so that if trade revived to a reasonable extent, he was hopeful of being able to recommend a further reduction later on.

GAS AFFAIRS AT BIRKENHEAD.

Last Wednesday, at a special meeting of the Birkenhead Town Council, under the chairmanship of Alderman E. G. Mason, the Gas Committee's revised scale of charges for gas supplied by the Corporation to consumers, both inside and outside the borough boundaries, was ratified without comment.

As reported last week, p. 609, from the 1st of October the price will be increased by 6d. per 1000 c.ft.—*i.e.*, from 4s. 3d. to 4s. 9d.—to consumers inside the borough and from 4s. 9d. to 5s. 3d. to consumers outside the borough. The quantity supplied through penny-in-the-slot meters will be reduced from 16 to 15 c.ft. inside the borough, and from 14 to 13 c.ft. outside, while the charges for street lighting, power, and industrial purposes have also been revised.

Originally, the Committee recommended an increase of 9d. per 1000 c.ft.; but the proposal was defeated at the Council meeting, and a special meeting of the Gas Committee was then held, when the present recommendations were passed.

THE CONSUMPTION OF GAS IN THE STREET-LAMPS.

Alderman J. H. M'Gaul, the Acting Chairman of the Committee, replying to a query by Mr. R. P. Fletcher, said that the number of lamps in the borough was 2250, and they consumed 31 million c.ft. of gas annually. In addition, there were 725 lamps in the adjoining urban districts and on the Mersey Docks and Harbour Board estate, which were maintained by the Corporation, and each of which burned on an average 6 c.ft. per hour. The total consumption of these lamps was 15,907,950 c.ft. annually. There were also 184 double burner lamps on the Dock Estate, which consumed 4,037,328 c.ft. annually. This made a total consumption for all the lamps of 54 million c.ft. annually.

THE D NGERS OF CARBON MONOXIDE IN LIGHTING GAS.

[From the "British Medical Journal," Sept. 10.]

The report has been published of a Departmental Committee appointed (under the chairmanship of Sir William Pearce, M.P.) by the Board of Trade, to inquire as to the desirability of prescribing any limitation in the proportion of carbon monoxide used in ordinary lighting gas. At present there is no legal limitation; but since the report of a previous Committee, appointed by the Home Office in 1898, gas containing a very high percentage has not been distributed in this country.

The present Committee reports "that it is not necessary or desirable to prescribe any limitations of the proportion of carbon monoxide which may be supplied in gas used for domestic purposes." If there were reason to believe that gas undertakings will continue to follow the present practice in this country of keeping the percentage of carbon monoxide within moderate bounds, we should hesitate to criticize the present report. The country is certainly sick of official restrictions on industry. The Committee's report, however, is extremely likely to induce the directors of gas undertakings to make a series of dangerous experiments on the public; and we consider it our duty to point-out the dangers quite clearly, as the Committee has evidently failed to realize them.

The former Committee made a very thorough experimental inquiry into the dangers of poisoning by lighting gas in dwellings. This inquiry showed: (1) That the danger of poisoning is entirely due to the carbon monoxide in the gas; (2) that where ordinary coal gas is distributed, poisoning by gas in houses is extremely rare, whereas in American towns, where carburetted water gas—containing about 28 p.ct. of carbon monoxide, as compared with 7 p.ct. in coal gas—is distributed in place of ordinary coal gas, cases of poisoning are very frequent, a large proportion of these cases being suicidal, and a certain proportion homicidal; (3) that nearly all the cases are due to unlit gas being left turned on at night in bedrooms.

The experiments showed quite clearly why an increase in the proportion of carbon monoxide causes such a totally disproportionate increase in the risk of poisoning. It was found that when ordinary coal gas was allowed to escape in a room, even with a burner removed, it was almost impossible to produce a poisonous atmosphere at the sleeping level, however long the escape lasted. The gas always passed out through the walls, roof, &c., at a sufficient rate to prevent the percentage of carbon monoxide in the air from rising to the danger level. This was so in even comparatively small rooms. When, however, the percentage of carbon monoxide in the gas is considerably increased, a poisonous percentage at the sleeping level is easily produced. The American records show that, with carburetted water gas, poisoning may even occur although a window is left open.

It might be expected that because the risk of poisoning by ordinary coal gas is so very trifling, the additional risk due to a considerably higher percentage of carbon monoxide in lighting gas would still be quite small. Neither actual statistics nor the results of experiments justify this expectation. From figures quoted by the present Committee, as compared with those of the former Committee, it seems clear that there has been during the last few years in this country a great increase in the number of cases of poisoning by lighting gas, though the number is still small in comparison with the number in the United States. The increase in this country has been coincident with the increase in the partial admixture of water gas with coal gas. The water gas may either be made in a separate plant, or by the addition of steam to ordinary coal-gas retorts, though of this latter addition the report, quite unjustifiably, takes no account.

No analyses or experimental investigations of any kind seem to have been made by, or for, the Committee. Nor does it publish any summary of the evidence submitted to it. Its references to the statistics of poisoning by lighting gas are very meagre and unsatisfactory; and no mention is made of the large number of cases of suicides by lighting gas in the United States and the increasing number in this country. Nevertheless, it publishes in full an extraordinary memorandum from an unnamed official of the United States Public Health Service. It appears that this official thinks that an increase in the percentage of carbon monoxide in lighting gas is of no practical importance. He also imagines that the toxic action of carburetted water gas is largely due to the illuminant constituents, as "these are soluble in lipoidal tissue, and hence will be retained to a certain extent in the nerve cells."

There are often distinct economic advantages to be gained by supplementing by means of water gas the manufacture of coal gas; but it is very improbable that public opinion in this country will tolerate the risks which to all appearance will be run if the gas distributed contains as high a percentage of carbon monoxide as in towns in the United States. We do not favour putting legal restrictions on any industry unless a clear case has been made out for their necessity. We hope the necessity will not arise in this instance; but we also fear that gas engineers may be misled to such an extent by the present report that restrictive legislation may very soon become imperative.

It is always a difficult matter to balance risk to life against economic advantages; but so far as we can judge, the present Committee has both exaggerated the economic advantages of a very high percentage of carbon monoxide in lighting gas and greatly under-estimated the risk to life. It is at least evident that the report is quite unconvincing; and that the dangers due to increasing percentages of carbon monoxide in lighting gas will require to be watched with great care by members of the medical profession, and more particularly by medical officers of health.

In consequence of a strike, Roubaix was last week deprived of gas.

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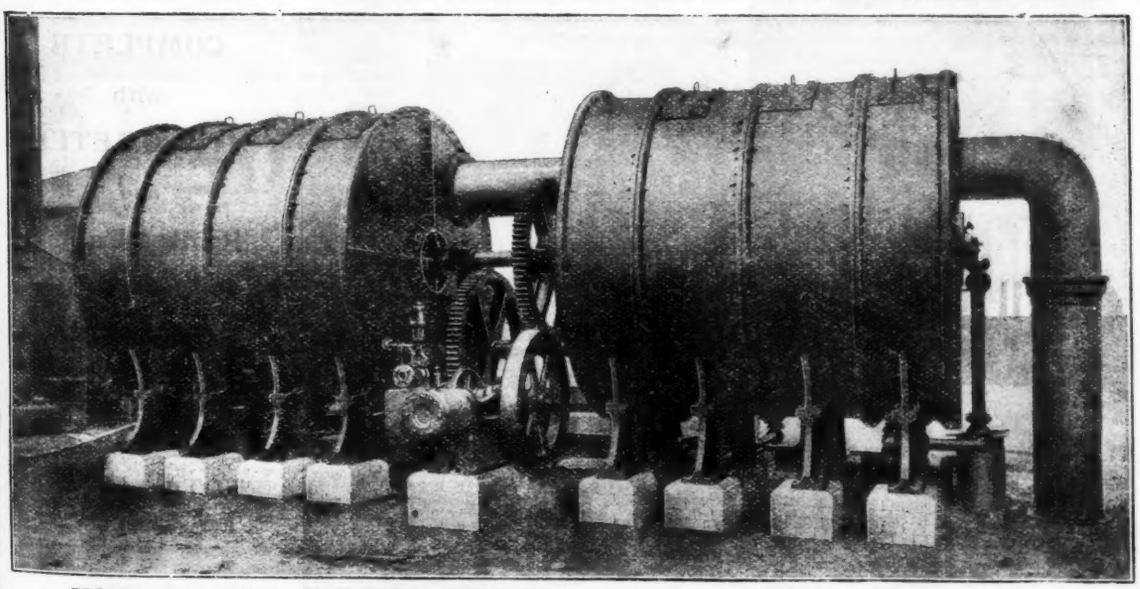

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POWER GAS FROM SEWAGE.

In the Engineering Section at the Edinburgh meeting of the British Association, Mr. J. D. DAWSON, of Birmingham, read a paper on "Power Gas from Sewage."

Recent experiments in Birmingham, he said, had shown that it was practical and economical to drive a suction engine with gas derived from sewage sludge. That organisms acting upon decaying vegetable matter had contributed to the formation of gas capable of being put to use, was not unknown to the scientific world; but to employ gas emanating from sewage sludge to drive plant which formed an essential part of an installation for the purification of sewage, was an achievement calculated to interest the economist. In a sewage district of 115 square miles, it was evident that some of the sewage—particularly the solid matter contained in it—must undergo partial decomposition before reaching the outfall. It was obvious, therefore, that the system which freed the liquid as speedily as possible, and subjected the solids to intensive fermentation under strict control, was an acceleration of Nature's methods; but it was not, as some had suggested, one of auto-digestion. The volume of wet sludge dealt with at Birmingham was not less than 400,000 tons a year. Similar volumes were sent out to sea from Glasgow and Manchester, and correspondingly less from Dublin and Southampton. But from London not less than 2,000,000 tons were every year shipped out to Barrow Deep, twenty miles east of Southend.

Mr. Dawson estimated that from Birmingham alone 9000 tons of dry solid matter were available to produce 320,000,000 c.ft. of gas, equal to 16,000,000 H.P. hours, taking 20 c.ft. per B.H.P. hour, which was equivalent to 4400 H.P. per day of ten hours. The pumping installation at Birmingham comprised a 34-B.H.P. horizontal gas-engine of the ordinary suction type, a 5 in. diameter centrifugal sludge pump, a sludge pump-well, two sludge digestion tanks for the generation of gas, and a gasholder, and was designed to give 25-B.H.P. for a working period of six hours per day. It should be observed that the plant was working under many disadvantages at present, which would not have been the case had there been more knowledge of the subject available when the plant was designed. But notwithstanding the drawbacks, the material fact arising out of the experiment was the successful trial run of the engine and pump, and the low cost of gas production.

In conclusion, Mr. Dawson submitted that it was both practical and economical to utilize gas emanating from sewage to drive an ordinary suction gas engine. It was too early, he said, to dogmatize upon what were the most favourable conditions; but the Birmingham case showed that it was not necessary to possess the Indian or the Australian climate to obtain power gas from sewage. He submitted that it was the duty of every local authority, in these days of enforced economy, to see that the gas which had hitherto been disposed of as something which was of less than no value whatever was utilized when possible and practicable.

CURRENT SALES OF GAS PRODUCTS.

The London Market for Tar, Tar Products, and Sulphate.

LONDON, *Sept.* 19.

There is little change to report in the London tar products market. There is a certain amount of inquiry for pitch; but makers' and buyers' ideas of price still continue divergent. The demand for road tar is now slackening somewhat; but a certain amount of material is still being absorbed in this direction. Creosote is steady at about 9d. to 9¼d. per gallon. Pure benzole and pure toluole are worth about 3s. 3d. to 3s. 6d. per gallon. Solvent naphtha 95/160 is firm at 3s. per gallon. Other products remain without change.

Considerable quantities of sulphate of ammonia are now being taken by home suppliers at the schedule prices as published.

Tar Products in the Provinces.

Sept. 19.

The average values for gas-works products during last week were: Gas-works coal tar, 56s. to 60s. Pitch, East Coast, 70s. to 75s.; West Coast—Manchester, 67s. 6d. to 70s.; Liverpool, 67s. 6d. to 70s.; Clyde, 67s. 6d. to 70s. Benzole 90 p.ct. North, 2s. 4d. to 2s. 6d.; crude 65 p.ct. at 120° C., 1s. 11d. to 2s. naked at makers' works; 50-90 p.ct., naked, North, 2s. 3d. to 2s. 4d. Toluole, naked, North, 3s. to 3s. 1½d. nominal. Coal tar crude naphtha in bulk, North, 11d. to 11½d. Solvent naphtha, naked, North, 2s. 8d. to 2s. 9d. Heavy naphtha, North, 2s. 7d. to 2s. 9d. Creosote, in bulk, North, liquid, 9d. to 9¼d.; salty, 8¼d. to 8½d. Heavy oils, in bulk, North, 10½d. to 11½d. Carbolic acid, 60 p.ct., 1s. 6d. Naphthalene, £20 to £30; salts, £7 to £9, bags included. Anthracene, "A" quality, 8d. to 10d. per minimum 40 p.ct.; "B" quality, nominal.

Manchester District Tar Prices.

The average prices realized for tar in the Manchester district, according to the sliding-scale, for the months of June, July, and August, were as follows: June, £3 6s. 5·66d. per ton; July, £3 11s. 3·86d. per ton; August, £3 11s. 3·86d. per ton.

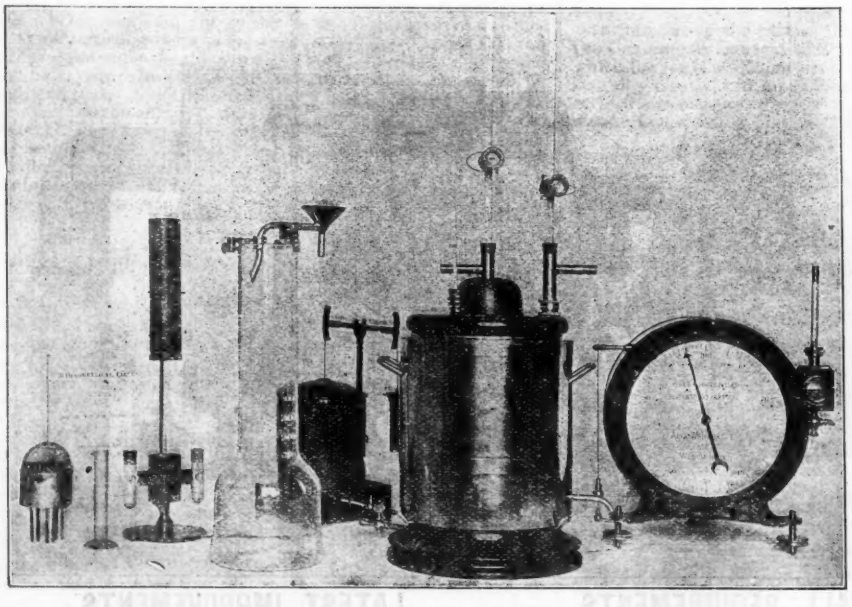
FROM A MARKET CORRESPONDENT.

Tar Products.

There is very little change in the tar product market since our last report, although some increase in the supply of most products is to be noted, due to the slow return to activity of the coke ovens. The future course of prices will, of necessity, depend upon whether demand will grow more quickly than supply, or *vice-versâ*; and the uncertainty which prevails on this point is probably the cause of the great amount of indecision now being displayed by all interested parties. Pitch is

BOYS CALORIMETER.

Gas Referees Latest Pattern.



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a slow trade, with very little demand for a very small supply. There is not even sufficient business to test prices, which are nominally in the neighbourhood of 85s. per ton. Naphthalenes are in poor demand, although there is a small inquiry for crudes for the fire-lighter industry, which is being met at £7 10s. to £8 10s. per ton. Refined remains in the neighbourhood of £18 per ton. Carbolic acid is still in the doldrums; but there is a little better demand for cresylic acid at 2s. 6d. per gallon, although manufacturers cannot be making much profit in producing it at this figure. Creosote is rather more plentiful; the price remains at 8½d. per gallon, although if the full average production were available it is difficult to see how such a price can be maintained. There is a better demand for solvent naphtha on the part of the rubber industry. At the moment, demand probably exceeds supply; but this does not seem to affect prices much, since the material is still available at 3s. per gallon. Benzole remains scarce and firm without any alteration in prices. There has been much better trade in intermediate products, and prices are well maintained. Salicylic acid is higher at 1s. 5d. per lb. for technical grade, and a still further advance is being looked for. Resorcin, technical, is 5s. 6d. per lb. Aniline oil and salts are 1s. 6d. and 1s. 8d. per lb. respectively. Anthracene, 40 to 50 p.ct., remains at 9d. per unit.

Sulphate of Ammonia.

There are no new features to report in this trade. Advices from America show that the market there is improving. France reports an active demand. All the French production has been absorbed by current orders, and it is likely that consumption for this year will exceed that of previous years, and France will come into the English market as a buyer.

Coke-Oven Gas at Sheffield.—For a considerable time past, the Sheffield Gas Company have been taking coke-oven gas generated at the Tinsley Park Colliery Company's plant; and the arrangement has been found so mutually satisfactory that the Gas Company have now arranged to take gas from the United Steel Company's coke-ovens at Orgreave. The United Steel Company have recently installed two modern batteries of coke-ovens.

Lighting of Wexford.—At a meeting last week of the Wexford Corporation, a letter was read from Mr. H. W. Saville, the Secretary of the Wexford Gas Consumers' Company, stating that, owing to a trade union order, lanterns could not be replaced for the public lighting in accordance with their contract. The Mayor (Alderman Corish) said the fact was that the union would not allow a certain man to act as "blackleg" for the gas-fitters, who were on strike; but it was necessary that lighting should be provided. To that end they must use whatever legal power they had, or pressure might be brought to bear in other ways. It was decided that the matter be left in the hands of the Finance Committee.

Financial Position at Aberdeen.—Owing to the coal strike, a deficit of over £15,000 has been notified by the Gas Committee of the Aberdeen Town Council. The Committee have therefore decided to recommend the Council to raise the price of gas by 9d. per 1000 c.ft., bringing the charge up to 4s. 4d. It is proposed, however, that the users of large quantities should be charged a reduced rate of 4s.

Dalbeattie Gas Company.—At the annual meeting of the Company, it was stated that the loss for the past year was £108, and that no dividend could be paid. The Chairman (Mr. Thomas Fraser) said the gas accounts showed an increase, and the coke and tar sales a decrease. The Directors had considered the question of introducing water gas; and it was resolved by the meeting that this matter should be taken up.

Maryborough (Queensland) Gas and Coke Company, Ltd.—The accounts for the first half of this year show a profit, after making provision for depreciation, working expenses, bad debts, and all other charges, and including the balance brought forward, amounting to £1646. The payment of the usual dividend of 6 p.ct. per annum, free of income-tax, left a sum of £409 to be placed to reserve for renewals and contingencies.

Dunfermline Gas Matters.—The sulphate of ammonia plant at the Dunfermline Gas-Works has been stopped, as it is stated to be unprofitable to make sulphate at present. Mr. James Campbell (the Manager) states in regard to the new installation of Woodall-Duckham retorts that the results obtained are considerably above the contractors' guarantee. In the increased make of 7,780,000 c.ft., there was a saving of 3358 tons of coal, and a decrease for nine months' working of £2619 in carbonizing wages.

Waterford Gas-Workers' Strike.—Through the intervention of the Mayor of Waterford the gas-workers in the city who had gone on strike resumed work after being out for two days. The Gas Company were not concerned in the dispute, which was solely between the workers—the fitters having left the Irish Transport Union to join the Engineers' Society, with the result that other members of the Transport Union declined to work with them. The stoppage caused great inconvenience and much loss to all sections of the citizens.

Public Lighting of Kirkburton.—The Kirkburton District Council are determined that the entire Council shall meet the Directors of the Gas Company to discuss terms for street lighting. The correspondence began in March; but the Company replied that they considered no good purpose would be served by meeting the whole of the Council, but that they would be glad to interview a committee. The Council thought this attitude on the part of the Company made it awkward to reach a settlement, and insisted on the Council meeting the Directors. The Council have now decided that, pending a meeting of the whole Council with the Company, no further action be taken. The Company have written stating that the public lamps will not be lighted until some terms are agreed upon; and there the matter stands.

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A Coal Stack on Fire.—Due to spontaneous combustion, a stack containing about 800 tons of coal at the Pinner Gas-Works caught fire. Gangs of labourers were promptly put to work, so as to remove the coal as rapidly as possible.

A Prosecution at Pembroke.—At the Pembroke Police Court, a case was heard against Mrs. Stratford, who was summoned for unlawfully causing a pipe to be laid for conveying gas to her residence; for damaging a pipe for supplying gas; and that she did fraudulently and improperly use or burn the gas supplied to her house by drawing the same through a rubber pipe connected with the main supply, without the gas passing through the meter. Defendant pleaded guilty. On the first charge, she was fined £1 5s.; the other two cases being dismissed on payment of 5s. costs in each case.

Safeguarding of Industries Act.—It is provided by Part 1 of the Safeguarding of Industries Act, which relates to key industries, that on and after Oct. 1, a customs duty of 33⅓ p.ct. *ad valorem* shall be paid on goods of certain general descriptions imported from foreign countries. The Act authorizes the Board of Trade to issue lists defining the articles which are to be taken as falling under any of the general descriptions set out in the schedule to the Act; and the Board have accordingly prepared lists under several headings—one of them being compounds (not including ores or minerals) of thorium, cerium, and the other rare earth metals.

Horley District Gas Company.—The Directors reported at the half yearly meeting of the Company last week that, compared with the corresponding period of the previous year, the sale of gas showed the substantial increase of 12·75 p.ct. During the whole period of the coal strike, the Company met the increased demands of consumers. The payment of dividends of 5 p.ct. per annum on the preference stock, 5 p.ct. on the "A" capital stock, and 3½ p.ct. on the "B" capital stock (all less income-tax), would leave a balance of £730 to be carried forward. The report was adopted, and there was recognition by speakers of the services of the Chairman and Directors, Engineer and Manager (Mr. T. H. Beaumont), and Secretary (Mr. B. Long).

Meter Registration Dispute at Carlisle.—At the Carlisle Police Court last Thursday, Mr. E. G. Elliott, of Lamley Bank, Scotby, was summoned by the Carlisle Corporation, who sought to obtain the determination of a dispute which had arisen between the parties as to the quantity of gas chargeable as having been consumed at Mr. Elliott's residence during the two quarters ended Dec. 31, 1920, and March 31, 1921. In consequence of the meter being inaccurate, an endeavour had been made by the Corporation to arrive at a fair adjustment; but in this they had not been successful. The Bench were therefore asked to determine what amount respondent should be ordered to pay. After adopting the usual calculations in these cases of the average consumption in previous years, and allowing a small credit due to the respondent, the balance due to the Corporation was said to be £25 12s. 9d. The Magistrates made an order against the respondent for the payment of the amount claimed, and £3 10s. costs.

Explosion at the Preston Gas-Works.—There was an explosion at noon on Saturday in the engine-house at the Walker Street works of the Preston Gas Company, said to have been caused by a "blow-back" of producer gas from the water-gas plant. Joseph Booth, engine tenter, was removed to the Royal Infirmary suffering from burns. With a plentiful supply of water from the mains, the fire brigade gained a mastery of the flames; but several minor explosions subsequently occurred. It was expected that the supply of gas in Preston and district would have to be curtailed for a day or two.

Proposed Purchase of the St. Anne's Gas Company.—A proposal to purchase the undertaking of the St. Anne's Gas Company has been agreed upon by the members of the St. Anne's and Lytham Councils and the Directors of the Company. The two towns hope to become a municipal borough; and it will be possible by the purchase to centralize the manufacture of gas, and supply at the same price throughout the district, and so effect a large economy in working costs. The authorized capital of the Company is £60,000, and, in addition, loan capital of £20,000 is authorized. Maximum dividends have been paid for many years.

The Buckhaven Town Council have decided to instal "A. & M." patent pressure-wave controllers to 100 of their street lamps.

An application is being made by the Hinckley Urban District Council for sanction to borrow £5000 for cookers, meters, and gas-fires, and the laying of new mains.

A defective electric circuit caused a fire early last Friday morning at a public house in Brompton Road. The flames spread rapidly; and several of the inmates had to be rescued by the firemen.

The Bradford Gas Committee have passed a resolution that in future new gas-mains required shall be purchased, if at all practicable, from English makers, even though foreign tenders may be lower.

A Wolverhampton man named John Poyner was found last week with his head in an oven, and the gas turned on. Artificial respiration was tried without success. Deceased had been depressed lately through being out of work.

An electric heating iron burned through a pressing table, last week, at the premises of Messrs. L. Whitham and Son, lingerie manufacturers, Sowerby Bridge, and set fire to a pile of cloth and cuttings on the floor. The police put out the fire.

The breakdown of a main switch at the Halifax electricity works, last Thursday, resulted in the complete stoppage of electric light, power, and tramways services for three-quarters-of-an-hour. This was at about 8 a.m., when the day's activities were starting.

Messrs. Head, Wrightson, and Co., Ltd., of Stockton-on-Tees, forward a full set of booklets of their well-known specialities, enclosed in a leather case, which is a useful method of keeping them together for reference. The booklets, which are of handy size, number upwards of twenty, and are fully illustrated.

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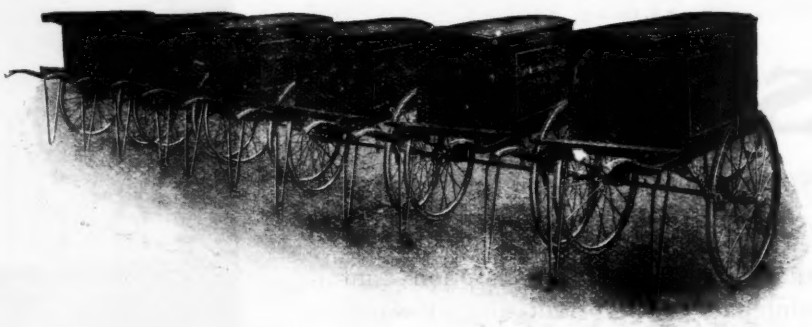

Prices on Application

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STOCK MARKET REPORT.

THE Stock Exchange has had a chequered week, the general tone alternating almost from day to day, with dulness predominating mostly; and the close was depressed by the breakdown of the Irish negotiations. The volume of business done was very moderate throughout. Gilt-edged securities were aided by the persistent cheapness of money, and Home Government issues were firm. Friday's figures for the big four were: Consols 47$\frac{15}{16}$–48$\frac{3}{8}$, War Loan 88$\frac{1}{4}$–88$\frac{7}{8}$, Funding 73—73$\frac{7}{16}$, Victory 75$\frac{3}{8}$–76$\frac{1}{4}$. Bonds were better on the whole. Home Rails dropped persistently, and closed dull. Canadians made a slight recovery, but fell back, and Argentines were quite down.

The Foreign Market was dull on adverse exchanges; Brazilian and Mexican alone holding up.

The Miscellaneous Market was disappointing, notwithstanding some indications of reviving trade. Rubber and Oil continued dull, and Textiles and Iron and Steel were easy.

Business in the Gas Market was fairly alive, though not abreast of the previous week's record, and very few of the minor companies were touched at all. Changes in quotations were comparatively few in number; but all were in the upward direction. The London companies were firm, and South Metropolitan preference advanced. In Suburban and Provincial, advances were scored by Croydon, Hastings and St. Leonards, South Suburban, and Southampton. In Foreign, Imperial Continental were steady, and Primitiva preference rose.

Bargains done for cash during the week were as follows: On Monday, Bombay 3, 3$\frac{1}{8}$, Commercial 4 p.ct. 56$\frac{1}{2}$, Continental Union 18, ditto preference 30, 31, 31$\frac{1}{2}$, Gas Light ordinary 59$\frac{3}{8}$, 60, 60$\frac{1}{4}$, 60$\frac{3}{8}$, ditto preference 59, 60, Imperial Continental 126, 126$\frac{1}{4}$, 127$\frac{1}{2}$, ditto debenture 80, South Metropolitan 70, 70$\frac{1}{2}$, Southampton 56, ditto debenture 56$\frac{1}{2}$, Wandsworth "C" 56, 56$\frac{1}{2}$, ditto new 56, 56$\frac{1}{2}$, South Metropolitan 6$\frac{1}{2}$ p.ct. debenture £57 paid 60, ditto fully paid 100$\frac{1}{2}$-100$\frac{1}{4}$. On Tuesday, European 7$\frac{7}{16}$, Gas Light ordinary 59$\frac{3}{8}$, 60, 60$\frac{1}{4}$, 60$\frac{3}{8}$, ditto maximum 45, 46, ditto preference 59, Imperial Continental debenture 80, South Metropolitan 69$\frac{3}{8}$, 70, 70$\frac{3}{8}$, 70$\frac{1}{2}$, ditto 6$\frac{1}{2}$ p.ct. debenture £57 paid 60, ditto fully paid 100$\frac{1}{2}$, South Suburban 66, Southampton 57, ditto debenture 57$\frac{1}{2}$. On Wednesday, Commercial 3$\frac{1}{2}$ p.ct. 52$\frac{1}{2}$, Gas Light ordinary 60, 60$\frac{3}{4}$, Imperial Continental (exceptional) 137$\frac{1}{2}$, Primitiva preference 34s., South Metropolitan 70$\frac{3}{4}$, 71, ditto 6$\frac{1}{2}$ p.ct. debenture £57 paid 60$\frac{3}{8}$-60$\frac{1}{2}$, ditto fully-paid 100$\frac{1}{2}$-100$\frac{3}{8}$. On Thursday, Gas Light ordinary 60$\frac{1}{2}$, 60$\frac{1}{4}$, 60$\frac{3}{8}$, 60$\frac{3}{4}$, 60$\frac{7}{8}$, ditto maximum 44$\frac{3}{4}$, ditto debenture 51$\frac{1}{2}$, Imperial Continental 126$\frac{3}{4}$, ditto (exceptional) 112$\frac{1}{2}$, Primitiva preference 34s. 6d., 35s., 35s. 6d., South Metropolitan 70, 70$\frac{7}{16}$, ditto 6$\frac{1}{2}$ p.ct. debenture £57 paid 60$\frac{1}{4}$-61, ditto fully-paid 100$\frac{7}{8}$-101$\frac{3}{8}$, South Suburban 68, ditto debenture 74$\frac{1}{2}$, Southampton debenture 57, Brighton and Hove 6 p.ct. preference B 82. On Friday, Commercial 3$\frac{1}{2}$ p.ct. 52$\frac{1}{2}$, ditto debenture 44$\frac{1}{2}$, European 7, Gas Light ordinary 60, 60$\frac{1}{2}$, 60$\frac{1}{4}$, 60$\frac{1}{2}$, ditto preference 59, 60, Ilford "A" and "C" 79$\frac{3}{4}$, Primitiva 13s., South Metropolitan 70$\frac{3}{4}$, 71, ditto 6$\frac{1}{2}$ p.ct. debenture £57 paid 60$\frac{3}{4}$-61, ditto fully-paid 100$\frac{3}{8}$-101$\frac{1}{4}$, South Suburban 67$\frac{3}{4}$, 68$\frac{3}{4}$, ditto debenture 73$\frac{1}{4}$, Wandsworth debenture 45$\frac{3}{8}$, 46$\frac{1}{2}$.

In the Money Market, the condition of extreme ease which characterized the previous week was firmly maintained, and, as Thursday approached, hopes of a reduction in the Bank rate arose; but it was not to be yet. Discount rates were similar. Silver was firm, closing at 39$\frac{1}{2}$d. The Bank rate is 5$\frac{1}{2}$ p ct., as fixed on July 12.

ANTE-WAR PRICES AND DIVIDENDS, LATEST DIVIDENDS, AND LAST WEEK'S BARGAINS.

Issues.	Share.	When ex-Dividend.	Ante-War Dividend & Bonus.	Last Dividend.	NAME.	Closing Prices, July 30, 1914.	Present Prices.	Lowest and Highest Prices of Bargains.
£			p.c.					
182,049	Stk.	Aug. 26	4	4%	Aldershot 4 p.c. Pref.	...	50—55	...
1,551,868	,,	Apl. 14	2½	3½%	Alliance & Dublin Ord.	59—64	45—48	...
374,000	,,	July 14	4	4%	Do. 4 p.c. Deb	76—79	46—51	...
280,000	5	Aug. 11	7½	4/—	Bombay, Ltd.	5¼—6½	3—3½	3—3½
100,000	5	,,	16	4/7½	Bournemouth Gas and Water { 5 p.c. B 7 p.c. Pref. 6 p.c 4 p.c. Deb.	... 15—15½ 13½—14 ...	7½—8½ 8½—9½ 7½—8½ ...	... ...
383,110	10	,,	7	7/—				
115,000	10	,,	6	6/—				
162,065	—	June 30	—	—				
992,045	Stk.	July 15	£4	4%	Brentford A Consolid.	261—266	67—70	...
734,920	,,	,,	£1	55/—	Do. B New	204—209	62—65	...
55,000	,,	,,	5	5%	Do. 5 p.c. Pref.	109—111	68—72	...
221,400	,,	June 15	4	4%	Do. 4 p.c. Deb.	91—93	57—50	...
214,775	,,	Aug. 26	£1	10s%	Brighton & Hove Orig.	208—213	110—115	...
244,200	,,	,,	8	7½%	Do. A Ord. Stk	154—159	77—82	...
1,287,500	Stk.	July 28	5	5%	Bristol 5 p.c. max.	...	...	...
530,000	20	Mar. 30	12½	10%	British	...	...	...
120,000	Stk	June 30	4	4%	Do. 4 p.c. Deb. Stk	44—45	22—24	...
245,771	,,	,,	4	4%	Buenos Aires 4 p.c. Deb	88—90	55—58	...
100,000	10	May 27	—	6%	Cape Town & Dis., Ltd	85—87	39—42	...
100,000	10	Apl. 28	—	6%	Do. 4½ p.c. Pref.	1½—2½	6½—7½	...
100,000	Stk.	June 30	4½	4½%	Do. 4½ p.c. Deb. Stk.	4—6	4½—5½	...
157,150	,,	Feb. 26	5	5%	Chester 5 p.c. Ord.	70—75	53—58	...
1,513,280	,,	July 28	5/9/4	42/8	Commercial 4 p.c. Stk.	108—110	...	...
560,000	,,	,,	5½	38/4	Do. 5½ p.c. do.	106—108	54—57	56½
475,000	,,	June 15	5	5%	Do. 3 p.c. Deb. Stk.	103—105	52—55	52½
800,000	,,	Dec. 11	4	—	Continental Union Ltd	69½—72½	44—47	44½
200,000	,,	,,	7	—	Do. 7 p.c. Pref.	76—79	18—20	18
51,600	,,	Aug. 26	£5	15%	Croydon A 10 p.c.	115—118	30—40	30—31½
278,400	—	,,	£12	12%	Croydon B and C 7 p.c	...	130—135	...
492,270	Stk.	—	£6	4½%	Derby Con. Stk.	,,	120—125	...
55,000	,,	—	£4	4%	Do. Deb. Stk.	123—125	...	...
5,002,180	10	Jan. 29	10	5/0	European, Ltd.	102—104	...	...
16,398,975	Stk	Aug. 11	4/17/4	46/8	Gas { 4 p.c. Ord. 3½ p.c. max. 4 p.c. Con. Pref 3 p.c. Con. Deb 10 p.c. Bonds.	17½—18	7—7½	7—7⅝
4,600,000	,,	,,	3½	35/—		98—102	59—61	59½—60½
4,062,235	,,	,,	£4	40/—		76—79	44—46	44½—46
4,674,850	,,	June 15	£3	3%		96—99	58—60	59—60
130,000	,,	Dec. 11	£10	10%		72½—74½	50—52	51½
82,500	,,	Sept. 14	£5	3½%	Hastings & St. L. 5 p.c.	...	...	...
258,740	,,	,,	3½	2½%	Do. 3½ p.c	...	48—50*	...
70,000	10	May 12	£1	5%	Hongkong & China, Ltd.	87—89	34—36*	...
86,600	Stk.	Aug. 26	9	9½%	Hornsey 7 p.c.	16½—16½	5—6	...
131,000	,,	July 28	7½	7½%	Ilford A and C	...	78—83	...
65,780	,,	,,	6½	5½%	Do. B	151—154	78—80	79½
65,500	,,	June 30	4	4%	Do. 4 p.c. Deb.	115—118	57—59	...
1,976,000	,,	May 27	9	5%	Imperial Continental	92—94	54—56	...
1,235,000	,,	Aug. 11	3½	3½%	Do. 3½ p.c. Deb. Red.	130—160	125—130	126—127½
255,242	,,	Mar. 30	6½	3½%	Isea Bridge Ord. 5 p.c.	84—86	79—81	80
2,498,905	,,	Feb. 26	10	37/6	Liverpool 5 p.c. Ord. { A B	119—121	68—70	...
306,083	,,	June 26	4	4%		211—213	...	...
165,756	,,	Aug. 11	7/5/6	6%		146—148	...	...
63,480	,,	Dec. 30	—	3%	Do. 4 p.c. Pr. Deb. Stk	...	...	...
75,000	5	June 11	6	3%	Maidstone 5 p.c.	...	54—56	...
250,000	100	Apl. 1	£4	4½%	Do. 3 p.c. Deb.	...	40— 43	...
341,920	Stk.	May 27	£4	6%	Malta & Mediterranean	4½—4¾	1¼—2¼	...
1,875,892	,,	July 28	£4	3%	Met. of Melbourne { 4½ p.c. Deb.	99—101	88—93	...
529,703	,,	June 30	3½	3½%	Monte Video, Ltd.	11½—12	55—60	...
15,000	10	Aug. 26	—	7/6	Newcastle & Gatsh'd Con	98½—99½	57½—58½	...
35,940	10	,,	7/14/10	5/3	Do. 3½ p.c. Deb	82—85	48½—50½	...
300,000	Stk.	May 12	£1	8%	North Middlesex 10 p.c.	...	12½—13½	...
60,000	5	Mar. 26	10	1/—	,, 7 p.c.	14—15	7½—8*	...
188,120	Stk.	June 30	—	3½%	Oriental, Ltd.	117—122	88—93	...
60,000	50	Aug. 26	13	60/—	Ottoman, Ltd.	7½—7¾	2—3	...
100,000	50	,,	£2	55/—	Plym'th & Stonch'se 5 p.c.	...	64—67	...
249,980	5	April 29	£1	—	Portsea Island, B	128—131	64—67	...
499,960	5	June 26	5	—	Do. C	128—131	51—54	...
321,600	100	June 1	£4	4%	Primitiva Ord.	5½—6	1—1½	13/—
600,000	Stk.	July 28	£4	4%	Do. 5 p.c. Pref.	4½—5	1½—1¾	34/—35/6
346,198	,,	June 30	£4	4%	Do. 4 p.c. Deb.	91—93	65—67	...
150,000	10	Mar. 30	£6	6/—	Do. ,, ,, 1911	...	39—42	...
135,000	50	June 30	£5	5%	River Plate 4 p.c. Deb.	85—87	39—42	...
135,000	Stk	Aug. 26	£10	5½%	San Paulo { 6 p.c. Pref. 5 p.c. Deb.	10½—11	6—6½	...
209,984	,,	,,	£10	5½%		47—49	35—38	...
583,500	,,	,,	£10	6½%	Sheffield A	223—224	61—62	...
133,201	Stk.	Sept. 13	£4	4½%	Do. B	222—224	60—62	...
90,000	10	June 30	£9	8½%	Do. C	220—222	59—61	...
6,609,895	Stk.	July 28	£4/10	5%	Shrewsbury 5 p.c.	...	...	...
250,000	,,	July 14	—	5%	South African	10½—11½	7—9	...
1,895,445	,,	,,	£5	5%	South Met. Ord.	111—113	69—71	69½—71
224,820	,,	Feb. 25	£3	3½%	Do. Red. Pref.	...	93—95	...
1,087,795	,,	Aug. 11	£6	7½%	Do. 3 p.c. Deb.	72½—74½	48—50	...
368,837	,,	June 30	£5	5½%	South Shields Con. Stk.	157—159	85—87	...
647,740	,,	May 12	£7	5½%	S'th Suburb'n Ord. 5 p.c.	114—116	67—69	66—68
121,275	,,	June 30	£4	4%	Do. 5 p.c. Deb. Stk.	116—118	73—76	73½—74½
120,000	,,	Aug. 11	£6	5½%	Southampton Ord.	99—102	55—58	56—57
782,275	,,	,,	£6	4½%	Do. 4 p.c. Deb. Stk.	...	59—61	56½—57½
181,255	,,	June 15	£4	4%	Tottenham { A 5 p.c. B 3½ p.c. 4 p.c. Deb.	135—138	62—64	...
182,380	,,	Dec. 30	£5	—		115—117	52—54	...
149,900	10	July 1	£3	5%		87—89	54—57	...
256,476	Stk.	Aug. 26	£5	5½%	Tuscan, Ltd.	5—6	1—2	...
50,000	,,	Aug. 11	£1	66/3	Do. 5 p.c. Deb. Red.	93—95	45—50	...
255,636	,,	,,	£6	51/3	Tynemouth 5 p.c. max.	101½—109	66½—68½	...
108,075	,,	,,	—	46/4½	Wandsworth, Wimbledon, and Epsom—			
140,865	,,	,,	—	46/4½	Wandsworth A 5 p.c.	131—136	78—80	...
552,000	,,	,,	£4	45/—	Do. B 3½ p.c.	129—134	57—59	
98,000	,,	,,	£4	50/—	Do. C	...	57—59	56—56½
88,476	,,	June 30	£1	3%	New Ordinary	...	57—59	56—56½
					Wimbledon 5 p.c.	117—122	53—55	
					Epsom 5 p.c.	121—126	57—59	
					¶ p.c. Deb. Stk.	66—60	44—47	45½—46½

* Ex Div.

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SOLIHULL GAS COMPANY,

APPLICATIONS are invited for the Position of WORKING MANAGER. Annual output, 45,000,000 c.ft. District increasing rapidly, which will necessitate Extensions at the Gas-Works in the near future. Good House, large Garden, Coal, and Gas free.

Applications, endorsed "Works Manager," stating Age and full Particulars as to Experience, Qualifications, and Salary required, with *copies* of not more than Three Testimonials of recent date, to be addressed to the Chairman of the Gas Company and Delivered to the undersigned not later than Sept. 30.

S. P. ADKINS,
Secretary.

Gas Offices,
Mill Lane, Solihull,
Sept. 12, 1921.

OUNDLE GAS LIGHT AND COKE COMPANY (1910), LTD., OUNDLE, NORTHAMPTONSHIRE.

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Applications, stating Age and Experience, with *copies* of Testimonials and stating wages required, to be sent to G. S. EUSTON, Engineer and Manager, Northampton Gas Light Company, Abington Street, NORTHAMPTON, on or before the 27th of September, 1921.

ACCRINGTON DISTRICT GAS AND WATER BOARD.

THE Board invite Applications for the Position of DISTRIBUTION SUPERINTENDENT. A schedule of Duties and full Particulars as to the appointment may be obtained from the undersigned.

A. J. HARRISON,
General Manager.

Gas and Water Offices,
Accrington,
Sept. 9, 1921.

WOMBWELL URBAN DISTRICT COUNCIL.

(GAS DEPARTMENT.)

APPOINTMENT OF CHIEF CLERK.

APPLICATIONS are invited for the above Appointment. Salary, £208 per Annum. Candidates should be thoroughly efficient with accounts and bookkeeping.

Applications, stating Age, Experience, and Qualifications, accompanied by *copies* of Two recent Testimonials and endorsed "Chief Clerk, Gas Dept.," must be sent to the undersigned not later than 9 a.m. on Monday, the 3rd day of October, 1921.

P. M. WALKER,
Clerk to the Council.

Town Hall,
Wombwell,
Sept. 15, 1921.